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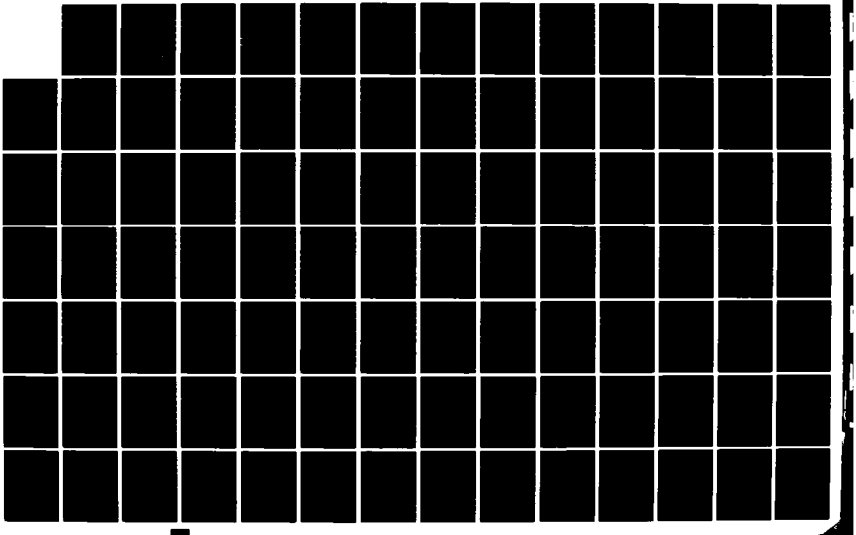

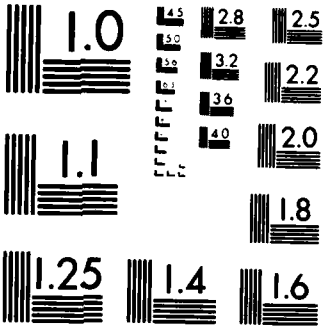

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Wharton

Econometric Forecasting Associates

China

Macroeconomic Model

SPECIFICATION REPORT

USER'S GUIDE

SCENARIO REPORT

TRADE DATA SOURCES REPORT

U.S. Department of State

Contract No. 1724-220-144

November, 1984

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SPECIFICATION REPORT

INTRODUCTION

The Wharton China Macroeconomic model is an 11-sector input-output flow model of China's Gross Domestic Product (GDP) capable of making projections from the base year, 1983. There are three agricultural sectors, six industrial sectors, and two other sectors. The model is designed and implemented for microcomputers using the Supercalc2 spreadsheet software with a minimum of 64K of random access memory. Hence it is usable with 8-bit as well as 16-bit machines.

The model generates projections of both Net Material Product (NMP) and GDP, in both current and constant (1980-price) yuan, as well as in current and constant (1980-price) dollars. The dollar variables are calculated with estimates of purchasing-power parity shadow exchange rates rather than with an official or internal exchange rate. These value-added projections are for both the whole economy and for each of the eleven sectors. Furthermore, the constant-priced variables are deflated with three different methods for comparison purposes: double-deflation (which gives the correct output total), single-deflation (which gives meaningful growth trends for individual sectors), and output- or demand-deflation (which gives both the correct output total and meaningful growth trends for individual sectors).

The input-output coefficients on which these calculations are based also vary over the projection period, so that assumptions can be made about shifts in sectoral composition and changes in efficiency of input use, such as energy input use.

At the same time the model generates sectoral balances for each of the eleven sectors. These balances consist of Gross Value Output, intermediate-uses, urban consumption, rural consumption, investment, and net exports (exports less imports), all in constant (1980-price) yuan. Exports and imports are also generated in current dollars for calculation of a current account balance. The major elements of the current account balance are the commodity

trade balance, net service exports, net in-transfers, and net interest earnings.

As part of the projections for agriculture, output projections are made for three major output categories, grains, other (non-grain) raw food products, and non-food raw materials. These latter two categories include projections for animal husbandry, marine products, forest products, and rural sideline products. Crop output projections are based on separate estimates for value-yields and planted area, the total of which conforms with estimates of cultivated land and a multiple cropping index.

For per capita calculations, separate projections are made for urban and rural populations.

Finally, the model is "closed" with a closing algorithm. The closing algorithm allows the modeler to assign exogenous weights which determine the degree to which two different variables are endogenously determined. Specifically, a modeler is frequently faced with differences between projections of (a) GDP produced and (b) the desired (exogenous) final demand pattern. The modeler uses the closing algorithm to choose weights between unity and zero determining adjustments in gross value output and efficiencies of intermediate-input use which reconcile the flows. The modeler may of course also adjust the pattern of final demand.

This completes the brief introduction to the Wharton China Macroeconomic model. A more detailed specification follows.

NOTATION

The mathematical specification of the model makes use of variable names according to a simple code. Each variable name is made up of from 4 to 8 letters, the combination of from 2 to 4 pairs of letters. In principle, each variable name has leading, middle, and trailing pairs of letters. In practice, the trailing pair, which denotes the units, is often omitted. In this case, the default units are constant-price 1980-yuan.

For example, for total grain imports in current dollars, the variable name **TMTGCN** has a leading pair **TM** (Total Imports), a middle pair **TG** (Total Grains), and a trailing pair **CN** (Current Dollars). If the trailing pair were omitted, as in **TMTG**, the variable would be total imports of grains in constant 1980 yuan.

Furthermore, there are sometimes two middle pairs, most frequently when the variable is a flow from one sector into another, or the coefficient of such a flow. For example, intermediate use inputs from energy into heavy industry in coefficient terms would be called UIEFOVCE, with the leading pair UI (Use for Intermediate Inputs), two middle pairs EF and OV (Energy and Fuels, and Other Heavy Industry), and a trailing pair CE (for coefficient). In this model, the only example of two middle pairs is the one given here, intermediate flows between two sectors.

Variables with the suffix (-1) represent variables from the base period. The base period is not necessarily the previous year, because the model can be used to project the economy over a period of years.

The various pairs used in the model, grouped as leading, middle, and trailing pairs, are introduced here.

LEADING PAIRS

Certain two-letter combinations used as leading pairs show the type of variable named:

CA Current Account Balance
CI Cropping Index
CN Final Consumption
CP Rural Consumption
CU Urban consumption

DA Demand Adjustment Index
DC Gross Domestic Product, Current Prices
DD Gross Domestic Product, Double Deflated
DO Gross Domestic Product, Output-Deflated
DP Gross Domestic Product Produced

DS Gross Domestic Product, Single-Deflated
EA Efficiency Adjustment
IN Investment
IP Interest Payments, Net
IR Interest Rate

IT Interest Rate
LC Land Cultivated or Cultivable
LS Land Sown, or planted area
MC Net Material Product, Current Prices
MD Net Material Product, Double-Deflated

MO Net Material Product, Output-Deflated
MS Net Material Product, Single-Deflated
NI Net Inflows, miscellaneous
PA Productivity Adjustment
PD Prices in Dollars

PP Purchasing Power Parity indexes
PY Prices in Yuan
PE Price Index of Exports
PM Price Index of Imports
PN Population

PR Per-capita Rural Consumption
PU Per-capita Urban Consumption
RE Rate of Exchange for Exports
RM Rate of Exchange for Imports
TB Commodity Trade Balance

TE Total Exports
TM Total Imports
UI Use for Intermediate Inputs between sectors
XO Gross Value Output
YD Yield (per hectare) in Value Terms

MIDDLE PAIRS

Other two-letter pairs are called "middle pairs" and are used to signify the economic sectors or subject of the variable. The list below gives first the basic 11 economic sectors around which the model is built. Other sectors or subjects are then listed:

The 11 Economic Sectors:

Agriculture:
TG Total Grains
OF Other (non-grain) Food Products
AW Agricultural Raw Materials and Products

Industry:
PF Processed Foods
CF Consumer Manufactures
EF Energy and Fuels
PM Producers' Machinery
AC Agricultural Chemicals
OV Other Heavy Industrial Sectors

Other:
PS Productive Sectors, Other
NS Non-productive Services

Other sectors or subjects:

AH Animal Husbandry
CC Capital Consumption (Depreciation)
CR All Crops
EC Whole Economy
FS Forestry

GM Green Manure
IC Industrial Crops
MP Marine Products
OD Other (non-grain) Food Crops
RL Sideline Products

RU Rural
TE Total Exports
TM Total Imports
UR Urban

TRAILING PAIRS

Finally, other pairs are used as trailing pairs to denote the units of the variable. The absence of a specific trailing pair implies units in contant 1980 yuan. Note that "growth ratios" are different from growth rates. A growth ratio of, for example, 1.042 is equivalent to a growth rate of 4.2 per cent. Growth ratios rather than growth rates are used in the model to simplify formulae and speed calculations.

CE Coefficient of intermediate use input flows
CN Current dollars
LN Current Yuan
DL Constant Dollars
GN Growth rate of current dollar variables

GR Growth Ratio of constant 1980-price yuan variables
NX Index
PC Per Capita

Because this variable-naming convention is based on pairs of letters, rather than the usual single letter i's and j's to represent several sectors, pairs of such letters will be used instead. The detailed model specification which follows will hence use the following shorthand terminology:

ii two letter i's will be used to refer to all sectors or a group of sectors as specified (e.g. XOii refers to gross value output of all sectors).

jj two j's will also be used to refer to all or a group of sectors when they are used twice in the same name, as for coefficients of flows from one sector to another (e.g. UIiijj). Hence, an iijj is equivalent to the more usual $_{ij}$ subscript notation.

SUM_{ii}( ) will be used to represent the summation of the variables within the parentheses over all ii , that is, over all sectors. For example, SUM_{ii}[XOii] represents the sum of gross value output for all sectors, that is, total gross value output.

* / + - denote multiplication, division, addition, and subtraction, respectively

This completes the introduction to the notation used in the detailed model specification below.

MATHEMATICAL SPECIFICATION

For convenience, the model will be presented in blocks, allowing easy recognition and review.

1. PRICES:

1.1 PYiiNX = PYiiNX(-1) * PYiiGR
1.2 PDiiNX = PDiiNX(-1) * PDiiGR
1.3 PYiiGR = Exogenously set by modeler
1.4 PDiiGR = Exogenously set by modeler

where ii = the eleven balance sectors and CC

For all eleven sectors and depreciation (CC), price indexes in yuan and dollars are generated from base-year levels using exogenous growth ratios set by the modeler.

2. SHADOW EXCHANGE RATES (Constant Yuan per Current Dollar):

2.1 REii = REii(-1) / PDiiNX
2.2 RMii = RMii(-1) / PDiiNX
2.3 PPiiCN = PPiiCN(-1) * PYiiNX / PDiiNX
2.4 PPii = PPii(-1)

For all eleven sectors, individual export and import shadow exchange rates relating constant 1980 yuan to current dollars (REii, RMii) are the exchange rates for the base year deflated by the dollar inflation index. Purchasing power parity exchange rates for domestic flows (PPiiCN) are the base-year rate deflated by the dollar price rise and reflated by the yuan price index. The purchasing power parity exchange rates relating constant 1980 yuan to constant 1980 dollars (PPii) are by definition constant at the base-year value.

3. POPULATION:

3.1 PNRU = PNRU(-1) * PNRUGR
3.2 PNUR = PNUR(-1) * PNURGR
3.3 PNEC = PNUR + PNRU
3.4 PNECGR = PNEC / PNEC(-1)
3.5 PNURGR = Exogenously set by the modeler
3.6 PNRUGR = Exogenously set by the modeler

Rural and urban populations (PNRU, PNUR) are generated with growth ratios over the levels in the base year. Total population (PNEC) is the sum of urban and rural populations, making its growth ratio (PNECGR) endogenous.

4. INPUT-OUTPUT COEFFICIENTS:

4.1 UIiijjCE = UIiijjCE(-1) * UIiijjGR / EAiiNX / PAjjNX
4.2 UIiijjGR = Exogenously set by the modeler
4.3 PAjjNX = Exogenously set by the modeler
4.4 EAiiNX = Calculated from model-closing algorithm

Where ii = all sectors, including NS
jj = all sectors, including NS

Input-output coefficients (UIiijjCE) for all sectors, including non-productive services (NS), show the flows from one sector of origin (ii) to a second destination sector (jj) as a share of the destination sector's gross value output. The coefficient for the projection period is adjusted from that of the base year in three ways.

First, an exogenous growth ratio (UIiijjGR) has been specified by the modeler. This growth ratio represents the best knowledge about that coefficient's likely shifts over time, reflecting technical change and shifting composition of the sector.

Second, the coefficient has been deflated by a general

productivity adjustment index (PAjjNX) for the destination sector (jj). This index is usually manipulated at a later stage of the model's use to correct for value-added coefficients which violate a priori expectations.

Third, the input-output coefficient has been deflated by a general efficiency adjustment index (EAiiNX) reflecting economy-wide efficiency in the use of inputs from the sector of origin (ii). By increasing this coefficient, there is increased conservation in all the intermediate uses of output from this sector. This coefficient is central to the workings of the closing algorithm, and through it the input-output coefficient itself becomes indirectly endogenous to a certain degree. For further details, see the introduction to the model above, and the specification of the closing algorithm below.

5. DEPRECIATION COEFFICIENTS

5.1 CCiiCE = CCiiCE(-1) * CCiiGR
5.2 CCiiGR = Exogenously set by modeler

where ii = all sectors, including NS

The coefficient of depreciation (capital consumption) as a share of gross value output (CCiiCE) in each sector (ii) is generated from base-year levels using an exogenous growth ratio set by the modeler and reflecting changes in capital productivity and depreciation as a share of capital stock.

6. DOUBLE-DEFLATED VALUE-ADDED COEFFICIENTS

6.1 DDjjCE = 1 - SUM_{ii}[UIiijjCE],

where ii = all sectors, including NS
jj = all sectors, including NS

The double-deflated value-added coefficient for gross domestic product of any sector jj (DDjjCE) is unity less the sum of all the intermediate-use coefficients (input-output coefficients) into that sector, including non-productive services (NS). Charges for depreciation are not included.

6.2 MDjjCE = 1 - SUM_{ii}[UIiijjCE + CCjj],

where ii = all sectors except NS
jj = all sectors except NS

The double-deflated value-added coefficient for net material product of any material sector jj (MDjjCE) is unity less the sum of all the intermediate-use coefficients (input-output coefficients) into that sector, ignoring the one for non-productive services (NS). The sector's depreciation (CC) is also included.

7. CURRENT-PRICED/SINGLE-DEFLATED VALUE-ADDED COEFFICIENTS

7.1 DSjjCE = 1 - SUM_{ii}[UIiijjCE * PYiiNX / PYjjNX],

where ii = all sectors, including NS
jj = all sectors

The current-priced/single-deflated value-added coefficient for

gross domestic product of any sector jj (DDjjCE) is unity less the sum of all the intermediate-use coefficients (input-output coefficients) into that sector, including non-productive services (NS), with each coefficient double-reflated with relevant yuan price indexes. Charges for depreciation are not included.

7.2 $MDjjCE = 1 - SUM_{ii}[\ UIiijjCE * PYiiNX / PYjjNX + CCjj * PYCCNX\ ],$

where ii = all sectors except NS
jj = all sectors except NS

The single-deflated/current-priced value-added coefficient for net material product of any material sector jj (MDjjCE) is unity less the sum of all the intermediate-use coefficients (input-output coefficients) into that sector, double-reflated with the respective yuan price indexes. Coefficients for inputs from and into non-productive services (NS) are ignored. Each sector's depreciation (CC), reflated to current prices, is also included.

Note that coefficients for single-deflated value added and current-priced value added are the same. They differ only in their use. For current price flows, the coefficients are multiplied by current-priced gross value output. For single-deflated value added, the coefficients are multiplied by constant-priced gross value output.

8. CULTIVATED LAND:

8.1 LCEC = LCEC(-1) * LCECGR
8.2 LCECGR = Exogenously set by modeler

Land under cultivation (LCEC) is the simple product of cultivated land in the base year and the exogenous growth ratio (LCECGR), which is usually negative as other land uses encroach on cultivation.

9. TOTAL PLANTED AREA:

9.1 LSEC = LCEC * CIEC
9.2 CIEC = CIEC(-1) * CIECGR
9.3 CIECGR = Exogenously set by the modeler
9.4 LSECGR = LSEC / LSEC(-1)

Planted area, the total land sown to crops (LSEC), is the product of cultivated land (LCEC) and the multiple cropping index (CIEC), which describes the degree to which the same land is sown to more than one crop during the year. The multiple cropping index is determined using the base-year value and its exogenous growth ratio (CIECGR). The growth ratio of land sown to crops (LSECGR) is the ratio of the current-year and base-year values.

10. PLANTED AREA OF MAJOR CROP CATEGORIES:

10.1 LSii = LSii(-1) * LSiiGR
10.2 LSiiGR = exogenously set by the modeler

10.3 LSIC = LSEC - SUM_{ii}[LSii]
10.4 LSICGR = LSIC / LSIC(-1)

where ii = crop categories TG, OD, and GM

Land sown (LSii) for total grains, other (non-grain) food crops, and green manure (TG, OD, GM) are the products of base-year area sown to these crops and the exogenous growth ratios. Land sown to industrial crops (LSIC) is the endogenous difference between total land sown in the economy (LSEC) and the sum of land sown to the other three crops. The growth ratio of land sown to industrial crops (LSICGR) is its ratio to the base-year area planted.

11. VALUE YIELDS OF MAJOR CROP CATEGORIES:

11.1 YDii = YDii(-1) * YDiiGR
11.2 YDiiGR = exogenously set by the modeler

where ii = TG, OD, IC, and GM

Value yields (YDii) for total grains, other (non-grain) food crops, industrial crops, and green manure (TG, OD, IC, GM) in constant 1980-priced yuan are the product of the base-year yields and the exogenously set growth ratio (YDiiGR).

12. CROP GROSS VALUE OUTPUT:

12.1 XOii = YDii * LSii
12.2 XOTC = SUM_{ii}[XOii]
12.3 XOTCGR = XOTC / XOTC(-1)

where ii = TG, OD, IC, and GM

Gross value output (XOii) of total grains, other (non-grain) food crops, industrial crops, and green manure (TG, OD, IC, GM) is the product of land sown (LSii) and average value yield (YDii) for each crop category.

13. TOTAL CROP VALUE YIELD:

13.1 YDTC = XOTC / LSEC
13.2 YDTCGR = YDTC / YDTC(-1)

The average value yield for total crops (YDTC) is the ratio of total crop value output (XOTC) to land sown for all crops (LSTC). Its growth ratio (YDTCGR) is calculated relative to the base-year yield. It is possible for this average value yield

for all crops to grow much faster than that for any individual crop category, if over the projection period there has been a shift in cropping patterns towards the higher value-yield crops, especially vegetables.

14. OTHER AGRICULTURAL CATEGORIES' GROSS VALUE OUTPUT:

14.1 XOii = XOii(-1) * XOiiGR
14.2 XOiiGR = exogenously set by the modeler

where ii = AH, MP, RL, and FS

14.3 XOOF = XOOD + XOAH + XOMP
14.4 XOOFGR = XOOF / XOOF(-1)

14.5 XOAW = XOIC + XORL + XOFS
14.6 XOAWGR = XOAW / XOAW(-1)

Gross value output projections (XOii) for animal husbandry, marine products, rural sidelines, and forestry (AH, MP, RL, FS) are generated from the base-year level and an exogenously set growth rate (XOiiGR).

Gross value output of other (non-grain) raw food products (XOOF) is the sum of gross value output for other (non-grain) food crops, animal husbandry, and marine products (XOOD, XOAH, XOMP). Its growth ratio (XOOFGR) is relative to the base-year level.

Gross value output of non-food agricultural raw materials and products (XOAW) is the sum of gross value output for industrial crops, rural sidelines, and forestry products (XOIC, XORL, XOFS). Its growth ratio (XOAWGR) is relative to the base-year level.

This completes the agricultural gross value output sections of the model. The result is three aggregate sectors: grains, other (non-grain) raw food products, and non-food agricultural raw materials and products (TG, OF, AW). These three sectors are then

included as part of the eleven sectors for which there are economy-wide sectoral balances.

15. GROSS VALUE OUTPUT OF NON-AGRICUTURAL SECTORS:

15.1 XOii = XOii(-1) * XOiiGR
15.2 XOiiGR = exogenously set by the modeler or calculated from the model-closing algorithm

where ii = PF, CF, EF, PM, AC, OV, PS, and NS

Gross value output levels for processed foods (PF), consumer manufactures (CF), energy and fuels (EF), producer's machinery (PM), agricultural chemicals (AC), other heavy industry (OV), other productive sectors (PS), and non-productive services (NS) are generated from base-year levels and exogenous growth ratios. The growth ratios can also be determined by the model-closing algorithm, which approximates the growth ratios necessary to satisfy both intermediate- and final-use demands. For further details, see the introduction to the model above, and the specification of the closing algorith below.

16. TOTAL GROSS VALUE OUTPUT:

16.1 XOEC = SUM_{ii}[XOii]
16.2 XOECGR = XOEC / XOEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Total gross value output for the economy (XOEC) is the sum of the gross value output levels for the model's eleven aggregate sectors: total grains (XOTG), other non-grain foods (XOOF), non-food agricultural raw materials and products (XOAW), processed

foods (XOPF), consumer manufactures (XOCF), energy and fuels (XOEF), producers' machinery (XOPM), agricultural chemicals (XOAC), other heavy industry (XOOV), other productive sectors (XOPS), and non-productive services (XONS). The growth ratio of the economy's gross value output (XOECGR) is calculated relative to the base year.

17. GROSS DOMESTIC PRODUCT PRODUCED:

17.1 $DPii = XOii - SUM_{jj}[\ UIiijjCE * XOjj\ ]$

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS
where jj = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Gross domestic product (GDP) produced (DPii) is the difference between a sector's gross value output (XOii) and the sum of all intermediate uses made of that sector's output. The intermediate use by one sector (jj) of a second sector's (ii's) output is the product of the intermediate-use coefficient for flows between the two sectors (UIiijjCE), and the gross value output of the second sector (XOjj). The sum of all such intermediate uses determines that part of gross value-output (XOii) which is not available for final uses. The remainder, that part which is available for final use, is called GDP produced (DPii).

18. TOTAL GDP PRODUCED:

18.1 $DPEC = SUM_{ii}[\ DPii\ ]$
18.2 $DPECGR = DPEC\ /\ DPEC(-1)$

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Total GDP for the economy (DPEC) is the sum of GDP produced for each individual sector (DPii). Its growth ratio (DPECGR) is calculated relative to the base-year level.

19. FOB EXPORTS IN CONSTANT 1980-PRICE YUAN:

19.1 TEii = TEii(-1) * TEiiGR
19.2 TEiiGR = exogenously set by the modeler

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

19.3 TEEC = SUM_{ii}[TEii]
19.4 TEECGR = TEEC / TEEC(-1)

Total exports (TEii) for each balance sector are generated from the base-year level and an exogenous growth ratio (TEiiGR). Total exports for the whole economy (TEEC) are the sum of exports for each individual sector, and its growth ratio (TEECGR) is calculated relative to the base-year level.

20. FOB EXPORTS IN CURRENT DOLLARS

20.1 TEiiCN = TEii / REii
20.2 TEECCN = SUM_{ii}[TEiiCN]

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

20.3 TEiiGN = TEiiCN / TEiiCN(-1)
20.4 TEECGN = TEECCN / TEECCN(-1)

Exports in current dollars (TEiiCN) for each balance sector

are calculated from the constant 1980-price yuan export levels (TEii) and the shadow exchange rates for exports (REii) derived above. Total exports in current dollars for the economy (TEECCN) are the sum of exports for each sector.

The growth ratios of current-dollar exports for individual sectors and the whole economy (TEiiGN, TEECGN) are all calculated relative to base-year levels.

21. PER-CAPITA URBAN CONSUMPTION IN CONSTANT 1980-PRICE YUAN:

21.1 PUii = PUii(-1) * PUiiGR
21.2 PUiiGR = exogenously set by the modeler

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

21.3 PUEC = SUM_{ii}[PUii]
21.4 PUECGR = PUEC / PUEC(-1)

Per-capita urban consumption levels (PUii) for each balance sector are generated from the base-year level and an exogenous growth ratio (PUiiGR). Per-capita urban consumption levels for the whole economy (PUEC) are the sum of per-capita urban consumption levels for each individual sector, and its growth ratio (PUECGR) is calculated relative to the base-year level.

22. PER-CAPITA RURAL CONSUMPTION IN CONSTANT 1980-PRICE YUAN:

22.1 PRii = PRii(-1) * PRiiGR
22.2 PRiiGR = exogenously set by the modeler

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

22.3 PREC = SUM_{ii}[PRii]
22.4 PRECGR = PREC / PREC(-1)

Per-capita rural consumption levels (PRii) for each balance sector are generated from the base-year level and an exogenous growth ratio (PRiiGR). Per-capita rural consumption levels for the whole economy (PREC) are the sum of per-capita rural consumption levels for each individual sector, and its growth ratio (PRECGR) is calculated relative to the base-year level.

23. TOTAL CONSUMPTION IN CONSTANT 1980-PRICE YUAN:

23.1 CNii = PUii * PNUR + PRii * PNRU
23.2 CNiiGR = CNii / CNii(-1)

23.3 CNEC = SUM_{ii}D[CNii]
23.4 CNECGR = CNEC / CNEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Consumption for each balance sector (CNii) is the sum of urban and rural consumption levels, each calculated as the product of the respective populations (PNUR, PNRU) and per-capita consumption levels (PUii, PRii). Total consumption for the whole economy (CNEC) is the sum of consumption levels in each sector, and its growth ratio is calculated relative to the base year.

24. TOTAL INVESTMENT IN CONSTANT 1980-PRICE YUAN:

24.1 INii = INii(-1) * INiiGR
24.2 INiiGR = exogenously set by the modeler

24.3 INEC = SUM_{ii}[INii]
24.4 INECGR = INEC / INEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Investment (INii) for each balance sector is generated from the base-year level and an exogenous growth ratio (INiiGR). Investment for the whole economy (INEC) is the sum of investment for each individual sector, and its growth ratio (INECGR) is calculated relative to the base-year level.

25. FOB IMPORTS IN CONSTANT 1980-PRICE YUAN:

25.1 TMii = TMii(-1) * TMiiGR
25.2 TMiiGR = exogenously set by the modeler

25.3 TMEC = SUM_{ii}[TMii]
25.4 TMECGR = TMEC / TMEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Total imports (TMii) for each balance sector are generated from the base-year level and an exogenous growth ratio (TMiiGR). Total imports for the whole economy (TMEC) are the sum of imports for each individual sector, and its growth ratio (TMECGR) is calculated relative to the base-year level.

26. FOB IMPORTS IN CURRENT DOLLARS

26.1 TMiiCN = TMii / REii
26.2 TMECCN = SUM_{ii}[TMiiCN]

26.3 TMiiGN = TMiiCN / TMiiCN(-1)
26.4 TMECGN = TMECCN / TMECCN(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Imports in current dollars (TMiiCN) for each balance sector are calculated from the constant 1980-price yuan import level (TMii) and the shadow exchange rates for imports (REii) derived above. Total imports in current dollars for the economy (TMECCN) are the sum of imports for each sector.

The growth ratios of current-dollar imports for individual sectors and the whole economy (TMiiGN, TMECGN) are all calculated relative to base-year levels.

27. COMMODITY TRADE BALANCE:

27.1 TBECCN = SUM_{ii}[TEiiCN-TMiiCN]
27.2 TBECGN = TBECCN / TBECCN(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, and OV

The commodity trade balance (TBECCN) is the sum of net exports for each of the commodity balance sectors, that is, all the balance sectors except other productive sectors and non-productive services (PS, NS). The growth ratio of the commodity trade balance (TBECCN) is calculated relative to the base year.

28. NET SERVICE EXPORTS:

28.1 SEECCN = SUM_{ii}[SEiiCN-SEiiCN]
28.2 SEECGN = SEECCN / SEECCN(-1)

where ii = PS and NS

Service Exports for the whole economy, net, (SEECCN) are the sum of net exports for the two non-commodity balance sectors, other productive sectors and non-productive services (PS, NS). Its growth ratio (SEECGN)is calculated relative to the base year.

29. MISCELLANEOUS NET INVISIBLE INFLOWS:

29.1 NIECCN = NIECCN(-1) * NIECGN
29.2 NIECGN = exogenously set by the modeler

Net invisible inflows, miscellaneous (NI) are generated from the base-year level and an exogenous growth ratio (GR).

30. NET INTEREST PAYMENTS:

30.1 IPECCN = (IRECCN / (2 - IRECCN)) *
(TBECCN + SEECCN + NIECCN - 2 * DBECCN(-1))
30.2 IRECCN = exogenously set by the modeler

Net interest payments on international capital account (IPECCN) are calculated in a reduced-form function of the exogenously-set interest rate (IRECCN), the commodity trade balance (TBECCN), net service exports and miscellaneous service

inflows (SEECCN, NIECCN), and the level of net international indebtedness in the base period (DBECCN(-1)).

The function is based on a formula in which interest is calculated on the average debt level between the end of the base period and the end of the projection period. Hence, it approximates interest payments accurately only for single-year projections. For longer period projections, a current account balance for each of the years in the projection period would have to be found.

31. CURRENT ACCOUNT BALANCE:

31.1 CAECCN = TBECCN + SEECCN + NIECCN + IEECCN

The current account balance in current dollars (CAEC) is the sum of the commodity trade balance, net service exports, net miscellaneous inflows, and net interest earnings (TBECCN, SEECCN, NIECCN, IEECCN).

32. NET INTERNATIONAL INDEBTEDNESS:

32.1 DBECCN = DBECCN(-1) - CAECCN

End-of-year international net indebtedness is calculated as the level of indebtedness at the end of the base year, minus the current account balance in the projection year. This approximation is useful only for single year projections. Because an economy's current account balances and pattern of indebtedness are not linear over any period of time, no linear approximation can be relied upon for longer-term projections. A separate modeling of each year in the projection period is required.

33. DOUBLE-DEFLATED VALUE ADDED:

33.1 MDii = MDiiCE * XOii
33.2 MDEC = SUM_{ii}[MDii]
33.3 MDECGR = MDEC / MDEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, and PS

Double-deflated Net Material Product (NMP) by sector (MDii) is the product of the double-deflated NMP value-added coefficient (MDiiCE) and its matching sectoral gross value output. NMP for the whole economy is the sum of the sectoral components, excluding non-productive services (NS). Its growth ratio (MDECGR) is calculated relative to the base-year level.

33.4 DDii = DDiiCE * XOii
33.5 DDEC = SUM_{ii}[DDii]
33.6 DDECGR = DDEC / DDEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Double-deflated Gross Domestic Product (GDP) by sector (DDii) is the product of double-deflated GDP value-added coefficients (DDiiCE) and their matching sectoral gross value outputs. GDP for the whole economy is the sum of the sectoral components, including non-productive services (NS). Its growth ratio (DDECGR) is calculated relative to the base-year level.

34. SINGLE-DEFLATED VALUE ADDED:

34.1 MSii = MSiiCE * XOii
34.2 MSEC = SUM_{ii}[MSii]
34.3 MSECGR = MSEC / MSEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, and PS

Single-deflated Net Material Product (NMP) by sector (MSii) is the product of the single-deflated NMP value-added coefficient (MSiiCE) and its matching sectoral gross value output. NMP for the whole economy is the sum of the sectoral components, excluding non-productive services (NS). Its growth ratio (MSECGR) is calculated relative to the base-year level.

34.4 DSii = DSiiCE * XOii
34.5 DSEC = SUM_{ii}[DSii]
34.6 DSECGR = DSEC / DSEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Single-deflated Gross Domestic Product (GDP) by sector (DSii) is the product of single-deflated GDP value-added coefficients (DSiiCE) and their matching sectoral gross value outputs. GDP for the whole economy is the sum of the sectoral components, including non-productive services (NS). Its growth ratio (DSECGR) is calculated relative to the base-year level.

35. OUTPUT-DEFLATED/DEMAND-DEFLATED VALUE ADDED:

35.1 MOii = MSii * MDEC / MSEC
35.2 MOEC = SUM_{ii}[MOii]
35.3 MOECGR = MOEC / MOEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, and PS

Output-deflated Net Material Product (NMP) by sector (MOii) is the single-deflated NMP value-added level (MSii) corrected by the ratio of total double-deflated to single-deflated value-added. Output-deflated NMP for the whole economy is the sum of the sectoral components, excluding non-productive services (NS). Its growth ratio (MOECGR) is calculated relative to the base-year level.

35.4 DOii = DSii * DDEC / DSEC
35.5 DOEC = SUM_{ii}[DOii]
35.6 DOECGR = DOEC / DOEC(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Output-deflated Gross Domestic Product (GDP) by sector (DOii) is the single-deflated GDP value-added level (DSii) corrected by the ratio of total double deflated to single-deflated GDP. Output-deflated GDP for the whole economy is the sum of the sectoral components, including non-productive services (NS). Its growth ratio (DOECGR) is calculated relative to the base-year level.

36. CURRENT-PRICED VALUE ADDED:

36.1 MCiiCN = MSiiCE * XOii / PYiiNX
36.2 MCECCN = SUM_{ii}[MCiiCN]
36.3 MCECGN = MCECCN / MCECCN(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, and PS

Current-priced Net Material Product (NMP) by sector (MCiiCN) is the product of the single-deflated NMP value-added coefficient

(MSiiCE) and its matching sectoral current-priced gross value output. Current-priced gross value output is constant-priced gross value output (XOii) reflated with the yuan price index (PYiiNX). NMP for the whole economy (MCECCN) is the sum of the sectoral components, excluding non-productive services (NS). Its growth ratio (MCECGN) is calculated relative to the base-year level.

36.4 DCiiCN = DSiiCE * XOii / PYiiNX
36.5 DCECCN = SUM_{ii}[DCiiCN]
36.6 DCECGN = DCECCN / DCECCN(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Current-priced Net Material Product (NMP) by sector (DCiiCN) is the product of the single-deflated NMP value-added coefficient (DCiiCE) and its matching sectoral current-priced gross value output. Current-priced gross value output is constant-priced gross value output (XOii) reflated with the yuan price index (PYiiNX). NMP for the whole economy (DCECCN) is the sum of the sectoral components, excluding non-productive services (NS). Its growth ratio (DCECGN) is calculated relative to the base-year level.

37. OUTPUT DEFLATED VALUE-ADDED IN CONSTANT-PRICED DOLLARS:

37.1 MOiiDL = MOii / PPiiCN / PDiiNX
37.2 DOiiDL = DOii / PPiiCN / PDiiNX

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, and NS

Output-deflated NMP in 1980-price dollars (MOiiDL) is output-deflated NMP converted to current dollars by the purchasing power parity exchange rate (PPii) and then deflated by the dollar price

index (PDii). Similarly, output-deflated GDP is the constant-yuan estimate (DOii) converted to current dollars and deflated to 1980 price levels.

38. VALUE-ADDED IN CURRENT DOLLARS:

38.1 MCiiCN = MOii / PPiiCN
38.2 DCiiCN = DOii / PPiiCN

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

Current-priced value added in dollars (MCiiCN, DCiiCN) is constant-yuan level (MOii, DOii) converted to current dollars by shadow exchange rates (PPiiCN).

This completes the brief technical introduction to the basic model. Included below is a description of the closing algorithm.

39. CLOSING ALGORITHM - DEMAND ADJUSTMENT REQUIREMENT:

39.1 DAii = DPii - (TEii + CNii + INii - TMii)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

The demand adjustment requirement (DAii) measures the degree to which initial exogenous specifications for output, final demand, and intermediate-use are incompatible. For initial rounds of calculation, the growth rates of these three components of sectoral balances are set by the modeler, and hence they normally generate a discrepency. This discrepency is measured as the difference between GDP produced for each sector (DPii) and the total of final demand components, exports, domestic consumption, investment, and imports (TEii, CNii, INii, TMII).

40. CLOSING ALGORITHM - INTERMEDIATE-INPUT EFFICIENCY ADJUSTMENT:

40.1 EAii = EAii * [XOii - XPii]/[XOii - XPii - WTii * DAii]
40.2 WTii = Exogenously set by the modeler

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

The efficiency adjustment index (EAii) for intermediate-input use is calculated using a weight (WTii) expressing the degree to which the model is to be closed by adjusting intermediate efficiency. If all the discrepency is to be corrected through efficiency adjustment, then the weight would be set at 1.0. In this case, gross value output for the various sectors would remain unchanged.

In the other extreme, if the weight is set at 0.0, all the adjustment in that sector is to be corrected through a shift in gross value output growth, and the efficiency adjustment index would remain unchanged. Of course, if the modeler whishes to change neither the efficiency index nor gross value output, adjustments can be made in the exogenous projections of final demand components.

The formula generates the new adjustment index by correcting the current one with a ratio of the model's current intermediate use (XOii - XPii) and the desired (weighted) intermediate use (XOii - XPii - WTii * DAii). This value of the adjustment index is then used for the model's next iteration.

41. CLOSING ALGORITHM - GROSS VALUE OUTPUT GROWTH ADJUSTMENT

41.1 XOiiGR = [XOii + [1 - WTii] * DAii] / XOii(-1)

where ii = TG, OF, AW, PF, CF, EF, PM, AC, OV, PS, and NS

The growth ratio for gross value output of each sector (XOiiGR) is calculated from the ratio of what the model's current gross value output would have to become in order to meet the (weighted) demand adjustment needs ([1-WTii] * DAii).

In the extreme case where the weight were 1.0, none of the model-closing adjustment would be done through a change in gross value output growth; all would be adjusted through shifts in intermediate use (see above). In the other extreme, with a weight of 0.0, all of the adjustment would be accomplished through changes in gross value output.

In practice, the calculation of needed gross value output is only a linear approximation. Changes in gross value output result in secondary changes in intermediate-use requirements, necessitating further adjustments. However, the algorithm converges very quickly, and final small adjustments can be eliminated by setting all weights to 1.0 .

CONCLUSION

This completes the specification of the Wharton China macroeconomy model. It is a convenient and appropriate model for an economy in a rapid state of flux and adjustment. It gives maximum freedom to the modeler to use judgement and specialized sectoral knowledge for gauging China's future prospects. Its emphasis on different valuation and pricing schemes and on different definitions of constant-priced value added gives it a practical usefulness with many immediate applications.

The paragraphs which follow provide some discussion of the

accounting, technical, and policy relationships in the model.

ACCOUNTING RELATIONSHIPS

Three major areas in national accounting deserve attention with regard to the Wharton China Macroeconomic Model. First is the dual role played by input-output flows (intermediate-use flows) as central components in both sectoral balances and sectoral value-added calculations. Second is the relationship between current-priced and constant-priced (real) flows and aggregates in the model. Third are the different definitions of constant-priced value-added presented in the model for comparison purposes. Each of these three important areas is introduced below.

INPUT-OUTPUT FLOWS

It is possible to describe the model as operating on two different axes, sectoral balances and sectoral value added. These can also be referred to as the uses and sources of sectoral output, respectively. At the center of each axis are input-output flows, the intermediate-use flows of goods and services from one sector to another.

Sectoral balances describe the uses of sectoral output. Output (gross value output, to be exact) has several uses. It is used as inputs into other production; it is used for net exports (exports less imports); it is used for domestic final consumption (both private and by the state); and it is used for investment. These balances are crucial to the Wharton China model, as they are for any serious model, because all the uses must add up to the output total. For example, if output doesn't change, but intermediate uses increase, then some other component in the balances must decline; consumption, investment, or net exports must contract to make up the difference. A decline in net exports could be the result of either reduced exports or increased imports.

A very important example is that of energy. If intermediate uses of energy increase, either because the using sectors become less efficient or because sectors using a great deal of energy grow, while at the same time the output of energy does not keep pace, some other category of uses in the energy sector balance must adjust. The most likely adjustment is an increase in imports or a decrease in exports, but conservation in home energy use is also common.

There are sectoral balances for each of the eleven major sectors in the Wharton China model, all linked to input-output flows from the relevant sector to all of the eleven sectors. They form an important analytical tool for gauging the impact China's economy will have in the arena of international trade, as well as potential shortfalls in domestic consumption categories. Sectoral balances are presented in the mathematical specification above in blocks 17-26.

The second principle axis based on input-output flows is for sectoral inputs into production. If sectoral balances represent the uses of output, sectoral inputs represent the sources of output. Inputs into any sector are composed of intermediate-use inputs from other productive sectors, labor inputs, and the inputs from the production environment (plant, equipment, and the more general social and economic environment in general). These inputs are matched by expense outlays which pay for them: the costs of intermediate inputs, labor costs, profits, and taxes.

Hence, the same input-output flows at the heart of sectoral balances are also at the center of sectoral input calculations. Input calculations are important because they form the basis for measuring the value added, the net output, of a given sector. In general, whatever part of a sector's output does not come from intermediate-use inputs must come from either labor or the productive environment, both of which are the sources of value added. Direct measurement of value added is not always easy. Therefore, indirect measurement is frequent, deducting intermediate inputs from total output to determine value added as a residual.

This relationship is at the core of the Wharton model's

measurement of sectoral and total value added. As input-output flows change with respect to total output (gross value output), so must value added adjust. Just as for sectoral balances, the two major input components, intermediate (input-output) flows and value added, must sum to gross value output. These relationships are described in blocks 6-7 and 33-38 of the model's mathematical specification, presented above.

To summarize, input-output flows form the center of fundamental accounting relationships in the Wharton model. They deserve the attention given them in the model, where the flows are adjusted by trend growth rates as well as by efficiency and productivity adjustment indexes (EAiiNX and PAjjNX in block 4, respectively).

VALUATION RELATIONSHIPS

A second important category of accounting relationships deals with valuation, or pricing. In the most basic terms, it is important whether flows in the model are measured in current values, or whether they are corrected for inflation with price indexes which convert them to "real" flows. In some cases, such as checking a sector's profitability, current flows are suitable. In others, such as comparing sectoral balances for different years, real flows are required. Various valuation relationships are an important part of the Wharton China model and make its results more useful for interpretation and analysis.

The valuation relationships in the model are controlled by projections of yuan and dollar price indexes (see block 1, above). When combined with base-year price levels and shadow exchange rates, they generate the appropriate deflators and conversion factors.

A major use of the conversions is the calculation of current-priced value-added for each of the model's eleven sectors. Because relative prices shift over time, relative uses of inputs must shift as well if an industry or sector is to stay financially viable. Even in centrally planned economies there are accountants' books and financial statements for economic enterprises. However, when projections are made in real terms, corrected for inflation,

relative prices do not adjust, even though the pattern of input use must. In real terms, the calculation of sectoral value-added and profitability can give misleading results, even seemingly nonsensical ones, such as negative levels of value added.

Although there are interpretations for such results, they do not help determine if the projected resource flows are in harmony with projected price changes. To accomplish such a check, value added in current prices must be calculated. This is done in blocks 7, 36, and 38. The calculation adds an important dimension to the model's accounting framework.

A more obvious need for current-priced flows is in the projections for balance of payments in dollars. Again, a balance of payments is an economy's budget vis a vis the external world, it is an accounting rather than a "real" calculation. For this obvious reason, the model's shadow exchange rates convert real exports and imports from the sectoral balances to current dollar exports and imports. The shadow exchange rates are necessary because the prices at which China buys and sells on the world market bear no dependable relationship to the domestic prices in contemporary yuan, much less to constant price patterns used to calculate real balance flows.

Finally, as mentioned above, sectoral balances are best measured in real terms, corrected for inflation. This is because analysists are interested in what is really happening in the Chinese economy, to its output, consumption, and trade with the world. Inflation makes it difficult, and often impossible to say whether these variables are even increasing or decreasing, much less discuss their gradual trends over time. Hence, it is essential that most of the model, and in particular the sectoral balances, be in real terms. For this reason, the model's accounting framework is based on constant 1980-price yuan for its basic calculations.

This completes the introduction to Wharton's China model valuation accounting framework. The section which follows, however, is closely related, because it discusses the various competing methods for calculating "real" value added.

COMPETING VALUE ADDED DEFINITIONS

Value added is a measurement of output which ignores intermediate inputs purchased from other sectors. As mentioned above, in current terms, it also reflects the financial viability of the sector, to a certain degree. That is to say, in current prices, intermediate inputs are not going to be greater than gross value output, or even very close to it. If they were greater, value added would be negative and there would be no revenues net of inputs to pay labor costs, much less taxes and profits. The subsidies implied would be much greater than even the large subsidies enjoyed by certain Chinese industrial sectors.

Hence, current-priced value added is a benchmark of national accounting dependability. However, as also mentioned above, the significance of current-priced variables is clouded over time by the effects of inflation. Correcting value added for inflation is not as straightforward as might be imagined. In general, there are three methods for doing so, each with strengths and weaknesses. These three methods are called "single-deflated," double-deflated," and "output-deflated" sectoral value added.

The most straightforward method, and the one used by Chinese statisticians, is to take the current-priced measure of value added and deflate it by that sector's output price deflator. This has the advantage of being straightforward, and at the same time it gives some meaningful measure of the sector's actual contribution to total value added in the economy.

The method, however, has the potentially troublesome weakness that it does not give the correct national total for value added in the whole economy. This is because true net output for the whole economy is the useful output left over after all intermediate-use inputs have been taken away. Net output for the whole economy is really the net output useful for final demand and net exports in the sectoral balances. Sector by sector in current prices, these are by no means the same as the value-added contributions of the same sector.

For example, there may be a great deal of value added contributed from the coal sector, as labor-intensive mines produce a great deal of output with very little in the way of intermediate inputs. However, most of coal is used up in intermediate inputs, as fuel for steel and other industrial enterprises. Very little of it is available for final consumption to heat homes, especially in China, where home use of such fuels is severely restricted. As a result, value added in coal is high, but final uses are low.

To continue the example, the importance of the coal price deflator should reflect the importance of coal in net output. By deflating coal value added with the single-deflation technique, the coal price deflator is given much more importance than it would be if only net coal output from the sectoral balances were used as a weight. The same discrepency between sectoral value-added and net final output exists for all the other sectors. As a result, the deflation of total current-priced value added using the single-deflation method, with sectoral value-added weights, gives a different result from deflation of actual net sectoral output produced.

The second method for calculating value added is called "double deflation," because the input-output coefficients are deflated twice, once for the numerator input flow, and once for the denominator destination output level. See blocks 4 and 7 in the mathematical specification report above. In essence, the method deflates input-output flows by the sector of origin, and then subtracts it from the (deflated) destination sector. Each component of the value-added calculation is deflated separately.

Hence, when the calculation is made, subracting intermediate input flows from gross value output, the results reflect what the financial condition of the sector would have been if base-year prices prevailed. Needless to say, if a sector's certain inputs had increased because current prices were relatively cheaper than in the base year, calculating value added in base year prices could result in a severely reduced sectoral value-added flow. It could even be negative.

Nevertheless, because the intermediate inputs are deflated by sector of origin, the implied measure of net output is accurate, and the resulting total value added for the economy perfectly matches what it would be if the sectoral levels net output produced were deflated by their respective deflators. In other words, "double deflation" gives the correct total for the whole economy, but the results for individual flows are not at all useful for saying what their real contribution to the total measure was. The total is right, but the parts are wrong.

The final method for measuring real value added is called "output deflation," and although it gives both the correct total and meaningful results for each sector, its interpretation is not as straightforward as that for the single- and double-deflation methods.

To be brief, output deflation takes the single-deflated sectoral output levels and re-deflates them by the ratio of total double-deflated output to total single-delflated output. In other words, the single-deflated measures of value output are deflated by the actual net output of the economy. The interpretation of output-deflated value added is interesting and useful, but not straightforward. Output-deflated value added deflates single-deflated output by an index of the change in relative purchasing power over final output patterns. It reflects the real command over the final market enjoyed by the value-added attributed to each sector.

Of the three measures of value added, output-deflated sectoral output is the most useful for studying the growth patterns of the economy and understanding where output is most dynamic. For this reason, it has been included as an integral part of the model's accounting framework. See blocks 35 and 37 above.

This concludes the discussion of the Wharton China model's accounting framework. It includes sectoral balances, sectoral input differentiation, flexible valuation combinations, and the three most useful and common measures of real net output by sector.

The paragraphs which follow discuss a few of the technical and

policy relationships in the model.

TECHNICAL RELATIONSHIPS

The principal technical relationships in the Wharton model deal with production and intermediate inputs. Both are fairly straightforward.

The production relationships in the model can be divided into those for agriculture and those for other sectors.

Agricultural output is itself separated into crop output and non-crop output sections. Crop output is treated in the greatest detail, because crops are by far the largest component in agricultural output, and because land is perhaps the most severe restriction on Chinese economic production of any kind. The crop output technology in the model is based on land available for planting and the value-yields obtained for the major crop categories.

Planted area is first determined from the combination of cultivated land and the multiple cropping index, both of which are generated with exogoneous growth ratios. With total planted area for the projection year determined as a control, planted area levels for total grains, non-grain foods, and green manure are also generated from exogenous information. The remaining planted area is assumed used for industrial crops. Green manure is included séparately because the area is significant, even though the value output is small.

With projections for planted area determined, value yields are generated from exogenous information. Base-year value yields are taken from Wharton's agricultural data banks. Value output is then calculated as the product of planted area and value yields.

In this way crop output projections have a technical foundation in the principle productive asset responsible for output, planted area. Assumptions about land use are some of the most important for

determining China's future agricultural output pattern. The Wharton model has them at the center of its agricultural projections.

Technical relations for output of both other agricultural sectors and non-agricultural sectors are limited to simple growth ratio projections by the modeler. This has the advantage of flexibility, but the disadvantage of limited endogenous checks on the relationship between investment, increased capacity, and increased ouput potential.

The second major category of technical relations in the model is described by the pattern of input-output flows and the change over time of technology embodied in the input-output coefficients. These changes reflect both a shift in sectoral composition and changes in efficiency of input use. For example, as natural fiber textiles become a less important part of consumer manufactures, the coefficient of agricultural raw materials into consumer manufactures will most likely decline, whether or not the textile industry is using those materials more or less efficiently.

On the other hand, intermediate use of energy and fuels is important for virtually every sector. Changes in use will reflect sectoral composition and savings in energy use by enterprises. The overall effect of studying and projecting these input coefficients, therefore, is to chart the energy efficiency of the economy as a whole, one of the most crucial technical relationships in any economy.

Other intermediate-use coefficients, although less dramatic, are also important indicators of China's technology and its changes: grains into animal husbandry, agricultural chemicals into grains and other foods, heavy industry into consumer manufactures, and perhaps most significantly, from each sector into itself along the input-output matrix's diagonal. These and other coefficients say a great deal about the shifting technical basis of the economy and are modeled with maximum flexibility in the Wharton China macroeconomic model.

In sum, technical relationships in the Wharton model encompass production and intermediate-input flows, which are modeled with a

great deal of room for flexibility and discretion by the modeler. Agriculture's output technology is tied closely to the severe land constraint and limits on value yields. The relationship between investment and increased industrial capacity is left to the descretion of the modeler. This is perhaps preferable to linking it with capital-output relations from China's past. With China's economy in such a rapid state of flux, there is a great deal to be said for technical relations which emphasize specialized sectoral information and assumptions.

POLICY RELATIONSHIPS

Given the specification of the Wharton model's eleven sectors, the emphasis on sectoral balances, the explicit inclusion of pricing shifts, the detail in agricultural production technology, and the division of population and consumption into urban and rural components, there is considerable opportunity to use the model to explore numerous policy options open to Chinese authorities. Some of the more interesting areas are introduced below.

Investment emphasis on some subset of sectors relative to another is one of the most fundamental policy positions under constant review by Chinese planners. In the most basic sense, the success of China's current reforms will decide whether consumer manufacturing and commerce (other productive services) will be stressed relative to other heavy industrial sectors. The emphasis on output of energy sources is a major policy variable. Will machine tools be developed even more rapidly as a domestic resource, rather than being imported? What about agricultural chemicals? China is unlikely to emphasize each of these equally. The choices made by authorities will profoundly affect China's economic structure and performance by the year 2000.

Prices represent a second major policy area for China's economic leadership. Two of the most interesting pricing problems involve agriculture and energy. The health of the rural economy and the continuation of China's successful agricultural expansion depend

to a certain degree on the prices of agricultural products relative to manufactured ones. Similarly, higher prices for energy inputs would improve efficiency in industry, but at the expense of reduced profitability for sectors which could not adjust their efficiencies of energy use. These policy options and their impact can be explored with the model's current-priced value-added projections and price adjustment features. In another price related policy issue, different assumptions about international prices for fuels would have significance for policy decisions about fuel exports and imports. This leads us to a third major policy area, foreign trade.

With the model's emphasis on secoral balances and their current-dollar balance of payments significance, the model can explore not only the "real" significance of sectoral deficits and surpluses, but also their importance for China's foreign exchange earnings. In addition to the critical areas of energy, consumer manufactures, and producers' machinery, the policy importance of grain import levels is going to be central for economic authorities for many years, even with continued growth in harvests. Given the model's explicit treatment of grain production, consumption and trade, as well as the division of consumption into urban and rural components, this difficult policy area can be fully explored.

The issue of grain balances includes a related policy choice of land use. China's scarce land will become more and more in demand for uses other than grain. This is reflected in the model both by the gradual reduction in cultivated area as well as by the increase in planted land to non-grain food crops and industrial crops. This fundamental area of policy choice is fully treated by the Wharton model, due to its technical basis in planted area and value yield projections.

Population control efforts are the last policy area we will mention in any detail. The size of China's population is of great importance for the success of future development. By separating urban and rural population growth trends, the model allows exploration of the likely possibility that birth control policies will be relaxed in the rural areas. The signficance of this division is increased when we consider the importance of official policy for the ability to migrate from rural to urban areas. The

pace of urbanization in China and the degree of family planning in rural areas are probably the two most important determinants of China's overall population growth for the remainder of the century and beyond. They are explicitly included in the model.

Given the complexity of the model and the large number of variables with policy interpretations under the modeler's influence, there are many more ways in which the model described above can be used to investigate the impact of different development strategies and techniques. Similarly, the major shifts in many parameters most likely associated with a reversal of the current reforms can all be modeled specifically.

This completes the discussion of policy parameters in the Wharton model, and also the discussion of the models specification. With its strong accounting framework and high degree of flexibility, the model is well suited to study the future of the Chinese economy in this period of such rapid shifts in both policy and technique.

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USER'S GUIDE

to

The Wharton China Macroeconomic Model

INTRODUCTION

The Wharton China macroeconomy model is made up of four Supercalc2 spreadsheet programs and a number of Supercalc2 execute commands (macros) which link the four spreadsheet programs together. This brief user's guide will first introduce the four spreadsheets and their controlling execute commands. It will then step through the process of running the model to generate a new scenario. The user should already be familiar with the Supercalc2 spreadsheet software and with the mathematical specification of the Wharton model given in the Specification Report.

THE FOUR MODELING SPREADSHEETS

The four modeling spreadsheets have names corresponding to their major modeling functions: input-output coefficient generation, real balance generation, value added flows, and final demand adjustment in the closing algorithm. These spreadsheet files are called COEFF..., BALAN..., FLOWS..., and FINAL..., respectively. The ... notation refers to the year for which the projection is being made, and which scenario it is, baseline, high, or low. For example, a baseline projection spreadsheet for 1995 input-output coefficients would be called COEFF95B. One for a high scenario for sectoral balances in 1990 would have the name BALAN90H, and so forth. The scenarios produced for this report are for the year 2000, and hence carry the year and scenario designations of 00B, 00H, and 00L. For convenience, these four spreadsheets will be considered for only one year and one scenario at a time. Therefore, the paragraphs below will refer to COEFF, BALAN, FLOWS, and FINAL when discussing the four spreadsheets.

Examples of these four spreadsheets are presented in Tables 1-6, which follow. Tables 1 and 2 present the large COEFF spreadsheet in two parts. Line numbers on the left-hand margin identify the parts of the spreadsheet. Tables 3 and 4 present the spreadsheet BALAN, which is also quite large. Tables 5 and 6 present the smaller spreadsheets FLOWS and FINAL. There is considerable duplication in the spreadsheets because of the space needed to load information from one spreadsheet into another. A brief discussion of these tables follows. Block numbers refer to the mathematical specification blocks in the Specification Report.

In each table the columns in general represent the eleven sectors and the total for the economy. Hence just at the top of the columns of statitics there is a row of two-letter codes

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2						Table 1								
3														
4					YEAR 2000 BASELINE COEFFICIENT TABLE - CHINA MACRO MODEL									
5														
6														
7	==========													
8	^CALCULATED CURRENT YEAR COEFFICIENTS:													
9	----------													
10	^PRICE INDEXES:		TG	DF	AN	PF	CF	EF	PM	AC	OV	PS	NS	CC
11	^Domestic Pr Indx ('80 = 1)		1.136	2.033	1.273	1.347	.855	1.524	.857	1.466	.872	1.357	2.238	.968
12	^Dol. Price Index ('80 = 1)		.914	1.423	1.216	1.088	1.283	1.086	.980	.906	.830	1.293	1.088	.818
13	^I-O COEFF. '80 PRICES:													
14	^Total Grains --> ...		.100	.017	.025	.059	.000	.000	.000	.001	.002	.002	.000	
15	^Other Foods --> ...		.073	.250	.106	.149	.000	.000	.000	.001	.003	.003	.000	
16	^Agricul. Raw. Mat. --> ...		.064	.168	.250	.092	.153	.000	.002	.001	.075	.042	.000	
17	^Processed Foods --> ...		.022	.035	.003	.359	.001	.000	.000	.033	.013	.001	.005	
18	^Consumer Manuf. --> ...		.000	.000	.000	.009	.298	.003	.038	.017	.014	.054	.154	
19	^Energy and Fuels --> ...		.023	.026	.007	.010	.011	.176	.017	.035	.039	.038	.045	
20	^Producer Machinery --> ...		.039	.027	.014	.013	.036	.064	.276	.016	.044	.137	.051	
21	^Agricultural Chem. --> ...		.156	.121	.183	.000	.000	.000	.000	.120	.000	.000	.000	
22	^Other Heavy Indus. --> ...		.006	.007	.004	.082	.093	.155	.210	.309	.280	.228	.137	
23	^Other Prod. Sectors --> ...		.013	.014	.009	.054	.038	.095	.065	.098	.093	.354	.042	
24	^Non-Prod. Services --> ...		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.381	
25	^MISCELLANEOUS DATA:													
26	^Depreciation Coefficients		.003	.003	.003	.006	.011	.048	.027	.020	.023	.045	.022	
27	^Export Ex Rt ('80 Y/Cur $)		.545	.824	1.224	4.090	3.580	.449	1.779	1.858	1.560	1.638	1.946	
28	^Import Ex Rt ('80 Y/Cur $)		2.147	2.853	1.357	4.090	3.633	.467	1.799	2.027	2.340	1.638	1.946	
29	^Urban Population		554.4		Rural Populat		677.5		Total Populati		1232			
30	^PP Par Ex Rt ('80 Y/Cur $)		1.346	1.839	1.291	4.090	3.607	.458	1.789	1.942	1.950	1.638	1.946	.000
31	----------													
32														
33	----------													
34	=VALUE-ADDED COEFFICIENTS:		TG	DF	AN	PF	CF	EF	PM	AC	OV	PS	NS	
35	=NMP D-Deflated (1980 Yuan)		.501	.332	.396	.166	.358	.459	.364	.351	.414	.096		
36	=NMP Current-Priced		.387	.480	.312	.142	.248	.582	.304	.505	.284	.257		
37	=GDP D-Deflated (1980 Yuan)		.504	.335	.399	.172	.369	.507	.391	.371	.437	.141	.185	
38	=GDP Current-Priced		.389	.482	.315	.146	.260	.613	.335	.518	.310	.289	.428	
39	=Domestic Pr Indx ('80 = 1)		1.136	2.033	1.273	1.347	.855	1.524	.857	1.466	.872	1.357	2.238	.968
40	=Dollar Pr Indx ('80 = 1)		.914	1.423	1.216	1.088	1.283	1.086	.980	.906	.830	1.293	1.088	.818
41	=PP Par Ex Rt ('80 Y/Cur $)		1.346	1.839	1.291	4.090	3.607	.458	1.789	1.942	1.950	1.638	1.946	.000
42	==========													

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
39														
40						Table 2								
41														
42	==========													
43	*GROWTH RATIOS:													
44	----------													
45	*MISCELLANEOUS VARIABLES:		TG	OF	AN	PF	CF	EF	PM	AC	OV	PS	NS	
46	*Domestic Pr Indx ('80 = 1)		1.088	1.653	1.288	1.225	.918	1.400	.903	1.288	.918	1.267	2.113	.992
47	*Dol. Price Index ('80 = 1)		1.000	1.400	1.184	1.100	1.184	1.288	.918	1.145	.950	1.184	1.015	.892
48	*Disembodied Productivity		1.050	.995	1.522	1.010	1.015	1.005	1.010	1.005	1.020	.995	.965	
49	*Economy-wide Input Effic'cy		.9384	.5904	.5428	.9574	1.639	1.901	1.248	1.039	.9430	1.016	.5356	
50	*I-O COEFFICIENTS GROWTH:													
51	*Total Grains --> ...		1.066	1.071	.700	.422	1.050	1.060	1.055	1.060	1.045	1.071	1.104	
52	*Other Foods --> ...		1.613	1.787	1.113	.671	1.669	1.685	1.677	1.685	1.661	1.702	1.755	
53	*Agricul. Raw. Mat. --> ...		1.754	1.851	1.937	1.824	2.359	1.833	1.824	1.833	1.806	1.851	1.909	
54	*Processed Foods --> ...		.995	1.050	.686	4.654	1.029	1.039	1.034	1.039	1.024	1.050	1.082	
55	*Consumer Manuf. --> ...		.581	.613	.401	.604	.691	.607	.604	.607	.598	.613	.632	
56	*Energy and Fuels --> ...		10.02	10.57	3.455	.521	.518	.628	.521	.785	.516	.529	.545	
57	*Producer Machinery --> ...		2.289	2.416	.790	.793	.789	1.594	1.190	.797	.785	.805	.830	
58	*Agricultural Chem. --> ...		2.750	4.352	2.845	.953	.948	.958	.953	1.341	.943	.967	.997	
59	*Other Heavy Indus. --> ...		1.010	1.066	.697	1.050	1.045	3.165	.840	.633	.936	1.066	1.099	
60	*Other Prod. Sectors --> ...		.938	.989	.647	.975	.970	.979	.975	.979	.965	3.463	1.020	
61	*Non-Prod. Services --> ...		1.778	1.877	1.227	1.849	1.840	1.858	1.849	1.858	1.831	1.877	2.902	
62	*Depreciation Coef.('80 Y)		1.090	1.090	1.150	1.070	1.120	1.050	1.100	1.130	1.080	1.120	1.090	
63	*Export Ex Rt ('80 Y/Cur $)		1.000	.714	.845	.909	.845	.776	1.089	.873	1.053	.845	.985	
64	*Import Ex Rt ('80 Y/Cur $)		1.000	.714	.845	.909	.845	.776	1.089	.873	1.053	.845	.985	
65	*Urban Population		2.424		Rural Populat		.865		Total Populati		1.217			
66	*PP Par Ex Rt ('80 Y/Cur $)		1.000	.714	.845	.909	.845	.776	1.089	.873	1.053	.845	.985	
67	==========													
68	LOADED FROM PREVIOUS PERIOD COEFFICIENT SPREADSHEET:													
69	----------													
70	PRICE INDEXES:		TG	OF	AN	PF	CF	EF	PM	AC	OV	PS	NS	CC
71	-Domestic Pr Indx ('80 = 1)		1.044	1.230	.989	1.099	.931	1.089	.949	1.138	.950	1.071	1.059	.976
72	-Dol. Price Index ('80 = 1)		.914	1.017	1.027	.989	1.083	.843	1.068	.792	.874	1.092	1.072	.917
73	I-O COEFF. '80 PRICES:													
74	-Total Grains --> ...		.094	.016	.035	.140	.000	.000	.000	.001	.002	.002	.000	
75	-Other Foods --> ...		.045	.140	.095	.222	.000	.000	.000	.001	.002	.002	.000	
76	-Agricul. Raw. Mat. --> ...		.037	.091	.129	.051	.065	.000	.001	.000	.042	.022	.000	
77	-Processed Foods --> ...		.022	.033	.005	.077	.001	.000	.000	.032	.013	.001	.004	
78	-Consumer Manuf. --> ...		.000	.000	.000	.015	.431	.005	.062	.027	.023	.088	.244	
79	-Energy and Fuels --> ...		.002	.002	.002	.020	.022	.280	.033	.045	.075	.073	.083	
80	-Producer Machinery --> ...		.017	.011	.018	.017	.045	.040	.232	.020	.056	.170	.062	
81	-Agricultural Chem. --> ...		.057	.028	.064	.000	.000	.000	.000	.089	.000	.000	.000	
82	-Other Heavy Indus. --> ...		.005	.007	.005	.078	.089	.049	.250	.488	.300	.213	.125	
83	-Other Prod. Sectors --> ...		.014	.014	.014	.055	.040	.097	.067	.100	.096	.102	.041	
84	-Non-Prod. Services --> ...		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.131	
85	MISCELLANEOUS DATA:													
86	-Depreciation Coef.('80 Y)		.003	.003	.003	.006	.009	.046	.025	.018	.021	.040	.020	
87	-Export Ex Rt ('80 Y/Cur $)		.545	1.154	1.449	4.499	4.239	.579	1.633	2.127	1.482	1.939	1.975	
88	-Import Ex Rt ('80 Y/Cur $)		2.147	3.994	1.607	4.499	4.301	.601	1.652	2.321	2.223	1.939	1.975	
89	-Urban Population		228.7		Rural Populat		783.4		Total Populati		1012			
90	-PP Par Ex Rt ('80 Y/Cur $)		1.346	2.574	1.528	4.499	4.270	.590	1.642	2.224	1.853	1.939	1.975	.000
91	----------													

representing these sectors:

TG OF AW PF CF EF FM AC OV FS NS CC/TO

where CC/TO represents either capital consumption or the economy total, whichever is relevant. For the meanings of these letter codes, see the Specification Report discussion of notation.

Table 1 presents the first half of the COEFF spreadsheet. Lines 11 and 12 show the results of the price index projections (block 1). Lines 14 through 24 present the 121 input-output coefficients for the projection period (block 4). Line 26 gives the updated depreciation coefficients (block 5), and lines 27 and 28 give shadow exchange rates for exports and imports (block 2). Lines 29 and 30 present population data and the purchasing power parity shadow exchange rates, respectively (blocks 3 and 2).

The rest of Table 1 gives the value-added coefficients and duplicates the price and exchange rate results for loading into another spreadsheet (FLOWS). Rows 35 and 37 give the double-deflated value-added coefficients for NMP and GDP (block 6) and rows 36 and 38 give the current-priced/single-deflated value added coefficients (block 7).

Table 2, the lower half of the COEFF spreadsheet and a continuation of Table 1, presents the growth ratios (exogenous and derived) as well as the base-year data on which they are based. Hence, rows 46, 47, 71 and 72 generate the price index data. Similarly rows 63-66 and 86-90 generate the shadow exchange rates and population.

Table 2's input-output entries are somewhat different. Rows 48 and 49 are the productivity and efficiency adjustment indexes introduced in block 4. They are initially set by the modeler and later adjusted, although the efficiency index is eventually calculated by the closing algorithm in spreadsheet FINAL and then loaded into here. Rows 51-61 are the resulting growth ratios comparing the projection year estimates with base-year vlues in rows 74-84. The exogenous growth ratios introduced in block 4 are actually imbedded in the formulae for rows 14-24 in Table 1. Hence, when these are reset the relevant cells need to be edited. This completes the discussion of Tables 1 and 2.

Tables 3 and 4 present the two halves of the second major spreadsheet in the model, BALAN, which generates the real sectoral balances for each of the eleven sectors and for the economy as a whole.

Table 3's first three data rows, however, rows 7-9, are dedicated to the agricultural sub-model described in blocks 8-14 in the Specification Report. Row 7 generates cultivated land and planted area for the crop categories (TG, OD, IC, GM, and TC) total grains, non-grain foods, industrial crops, green manure, and total crops. Planted area for total crops in cell N7 is the product of cells C7 and F7 (cultivated land and the multiple

Table 3

YEAR 2000 BASELINE SECTORAL BALANCE FLOW TABLE - CHINA MACRO MODEL

									TG	OF	IC	GM	TC
^Total Cultivated Area (Ha)	71.7	^Cr Index:	2.1	^Planted Area (Ha):					96.0	12.2	34.0	6.4	148.6
^Animal Husbandry GVO ('80Y)	84.6	^All Sidelin:	296.3	^Val. Yield ('80Y/Ha					1407	13514	1666	81	2404
^Marine Products (1980 Y):	13.3	^Forest Prds:	43.5	^Crop GVO ('80 Y)					135.0	165.0	56.6	.5	357.2

^SECTORAL BALANCES:	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TD
^GVO (1980 Yuan)	135.0	262.9	397.0	278.2	534.4	165.86	490.9	141.1	715.9	850.4	676.2	4647.8
^GDP Produced (1980 Yuan)	87.3	98.4	46.5	146.2	191.2	10.6	118.9	-1.3	-19.9	348.7	418.7	1445.2
^FOB Exports (1980 Yuan)	1.6	6.2	11.7	3.7	164.5	5.7	2.4	.0	6.6	.5	.1	202.4
^FOB Exports (Cur. Dollars)	3.0	7.6	9.6	.9	46.0	12.7	1.4	.0	4.2	.3	.1	85.2
^Urban Per Cap. C. ('80 Y)	88.4	108.2	31.1	176.2	105.5	9.2	.1	.3	.0	171.0	617.7	1307.9
^Rural Per Cap. C. ('80 Y)	84.0	58.9	39.9	69.4	18.7	4.9	.2	5.8	.0	17.9	112.3	411.8
^GDP Consumption (1980 Yuan)	105.9	99.9	44.3	144.7	71.1	8.4	.2	4.1	.0	106.9	418.5	1004.0
^GDP Investment (1980 Yuan)	.0	.0	.0	.0	.0	.0	175.9	.0	4.4	241.3	.0	421.6
^FOB Imports (1980 Yuan)	20.2	7.7	9.5	2.2	44.5	3.6	59.6	5.4	30.9	.0	.0	183.5
^FOB Imports (Cur. Dollars)	9.4	2.7	7.0	.5	12.2	7.6	33.1	2.6	13.2	.0	.0	88.5

^CURRENT ACCOUNT AND DEBT:					
^Net Service Exports (Cur $)	.4	Commodity Trade Bal (Cur $)	-3.3	Interest Earnings, Net (Cur $)	1.4
^Net In-Transfers (Cur $)	.5	Current Account Bal (Cur $)	-1.0	Net Debt, Year-end (Cur $)	-9.6

#GROWTH RATIOS:								TG	OF	IC	GM	TC
#Total Cultivated Area (Ha)	.843	Cr Index:	1.225	Planted Area (Ha):				.843	2.013	1.936	1.000	1.033
#Animal Husbandry GVO ('80Y)	2.000	All Sideline:	5.898	Val. Yield ('80Y/Ha)				1.552	1.500	1.400	1.088	1.930
#Marine Products (1980 Y)	2.693	Forestry Prd:	3.700	Crop GVO ('80 Y):				1.308	3.019	2.710	1.088	1.993
#SECTORAL BALANCES:	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TD
#GVO (1980 Yuan)	1.308	2.580	4.761	3.5	3.1484	2.38	4.0469	8	4.5865	5.0240	7.7	4.009
#GDP Produced (1980 Yuan)	1.1313	1.7353	1.3657	2.2842	4.0669	1.3059	3.5367	-.6449	6.3345	3.4328	5.4875	2.9058
#FOB Exports (1980 Yuan)	5.054	1.600	5.895	5.460	5.054	2.113	1.522	2.113	1.288	2.292	2.113	5.460
#FOB Exports (Cur. Dollars)	5.054	2.240	6.980	6.006	5.984	2.722	1.397	2.419	1.224	2.714	2.145	3.830
#Urban Per Cap. C. ('80 Y)	1.042	1.350	.918	1.700	1.800	1.052	1.000	1.000	1.000	2.485	2.693	1.956
#Rural Per Cap. C. ('80 Y)	1.059	1.200	1.145	1.340	1.600	1.107	1.000	1.288	1.000	2.693	3.700	1.510
#GDP Consumption (1980 Yuan)	1.299	1.759	1.264	2.251	3.155	1.544	1.0996	1.136	.91516	5.106	5.490	2.739
#GDP Investment (1980 Yuan)	1.000	1.000	1.000	1.000	1.000	1.000	4.328	1.000	2.917	3.000	1.000	3.439
#FOB Imports (1980 Yuan)	4.328	1.9480	3.1590	2.292	5.5000	60.000	6.8000	3.4190	3.159	1.288	1.4	4.4918
#FOB Imports (Cur. Dollars)	4.33	2.73	3.74	2.52	6.51	77.28	6.24	3.91	3.00	1.52	1.42	5.02

#CURRENT ACCOUNT AND DEBT:			
#Net Service Exports (Cur $)	2.579	Interest Earnings, Net (Cur $)	1.350
#Net In-Transfers (Cur $)	1.000	Interest Rate, (Decimal)	.140

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
50														
51						Table 4								
52														
53	==========													
54	-(T-1) DATA:									TG	DF	IC	GM	TC
55	-Total Cultivated Area (Ha)		85.0	^Cr Index:		1.7	^Planted Area (Ha):			113.9	6.1	17.6	6.4	143.9
56	-Animal Husbandry GVO ('80Y)		42.3	^All Sidelin:		50.2	^Val. Yield ('80Y/Ha			907	9009	1190	74	1245
57	-Marine Products (1980 Y)		4.9	^Forest Prds:		11.8	^Crop GVO ('80 Y)			103.2	54.6	20.9	.5	179.2
58	----------													
59	-SECTORAL BALANCES:		TG	DF	AN	PF	CF	EF	PM	AC	OV	PS	NS	TO
60	-GVO (1980 Yuan)		103.2	101.9	83.4	79.5	169.7	69.690	121.3	17.6	156.1	169.3	87.8	1159.5
61	-GDP Produced (1980 Yuan)		77.2	56.7	34.0	64.0	47.0	8.1	33.6	2.0	-3.1	101.6	76.3	497.4
62														
63	-FOB Exports (1980 Yuan)		.3	3.9	2.0	.7	32.6	2.7	1.6	.0	5.1	.2	.1	48.8
64	-FOB Exports (Cur. Dollars)		.6	3.4	1.4	.1	7.7	4.7	1.0	.0	3.5	.1	.0	22.2
65														
66	-Urban Per Cap. C. ('80 Y)		84.8	80.2	33.9	103.7	58.6	8.8	.1	.3	.0	68.8	229.4	668.5
67	-Rural Per Cap. C. ('80 Y)		79.3	49.1	34.8	51.8	11.7	4.4	.2	4.5	.0	6.6	30.3	272.7
68	-GDP Consumption (1980 Yuan)		81.5	56.8	35.0	64.3	22.5	5.4	.2	3.6	.0	20.9	76.2	366.5
69	-NMP Investment (1980 Yuan)		.0	.0	.0	.0	.0	.0	40.6	.0	1.5	80.4	.0	122.6
70														
71	-FOB Imports (1980 Yuan)		4.7	4.0	3.0	.9	8.1	.1	8.8	1.6	9.8	.0	.0	40.8
72	-FOB Imports (Cur. Dollars)		2.2	1.0	1.9	.2	1.9	.1	5.3	.7	4.4	.0	.0	17.6
73	----------													
74	-CURRENT ACCOUNT AND DEBT:													
75	-Net Service Exports (Cur $)		.1	Commodity Trade Bal (Cur $)				4.6	Interest Earnings, Net (Cur $)					1.0
76	-Net In-Transfers (Cur $)		.5	Current Account Bal (Cur $)				6.3	Net Debt, Year-end (Cur $)					-10.6
77	==========													
78	%I-O COEFFICIENTS:													
79	%Total Grains --> ...		.100	.017	.025	.059	.000	.000	.000	.001	.002	.002	.000	
80	%Other Foods --> ...		.073	.250	.106	.149	.000	.000	.000	.001	.003	.003	.000	
81	%Agricul. Raw. Mat. --> ...		.064	.168	.250	.092	.153	.000	.002	.001	.075	.042	.000	
82	%Processed Foods --> ...		.022	.035	.003	.359	.001	.000	.000	.033	.013	.001	.005	
83	%Consumer Manuf. --> ...		.000	.000	.000	.009	.298	.003	.038	.017	.014	.054	.154	
84	%Energy and Fuels --> ...		.023	.026	.007	.010	.011	.176	.017	.035	.039	.038	.045	
85	%Producer Machinery --> ...		.039	.027	.014	.013	.036	.064	.276	.016	.044	.137	.051	
86	%Agricultural Chem. --> ...		.156	.121	.183	.000	.000	.000	.000	.120	.000	.000	.000	
87	%Other Heavy Indus. --> ...		.006	.007	.004	.082	.093	.155	.210	.309	.280	.228	.137	
88	%Other Prod. Sectors --> ...		.013	.014	.009	.054	.038	.095	.065	.098	.093	.354	.042	
89	%Non-Prod. Services --> ...		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.381	
90	%MISCELLANEOUS DATA:													
91	%Depreciation Coef.('80 Y)		.003	.003	.003	.006	.011	.048	.027	.020	.023	.045	.022	
92	%Export Ex Rt ('80 Y/Cur $)		.545	.824	1.224	4.090	3.580	.449	1.779	1.858	1.560	1.638	1.946	.0
93	%Import Ex Rt ('80 Y/Cur $)		2.147	2.853	1.357	4.090	3.633	.467	1.799	2.027	2.340	1.638	1.946	
94	%Urban Population		554.4	Rural Population			677.5	Total Population			1232			
95	----------													

cropping index). The other planted areas are generated from growth rates or are a residual (IC). See blocks 9 and 10. Units are in millions of hectares.

The right-hand columns in rows 8 and 9 generate gross value output of crops. Row 8 gives the value yields and row 9 the resulting crop output levels. Yields are measured in constant-priced 1980 yuan per hectare and output is in billions of 1980 yuan.

The left-hand columns in rows 8 and 9 generate gross value output for the other sub-sectors in agriculture (animal husbandry, marine products, all sidelines, and forest products. See block 14, equations 14.1.

Row 12 in Table 3 is one of the most important in the model and the first in the rows making up the sectoral balances; it generates gross value output for each of the eleven major sectors. The first three data columns (TG, DF, AW) are generated from the agricultural sub-model in rows 7-9. See blocks 12 and 14, equations 14.3 and 14.4 . The remainder of the cells in row 12 are generated from exogenous growth rates in row 36. See block 15 in the Specification Report. All data are in billion constant-priced 1980 yuan.

Row 13 in Table 3 is GDP produced, generated from Gross value output in row 12 and the input-output coefficients in rows 79-89 (see Table 4). The formulae are described in block 17.

Rows 15-24 in Table 3 represent the remaining elements of the sectoral balances (exports, domestic consumption, and imports) as well as the rural and urban per-capita components of consumption and the current-dollar equivalents of exports and imports. These are generated as described in blocks 19-26. Units are in billions of constant-priced 1980 yuan and billions of current dollars, except for the per-capita figures, which are in constant-priced 1980 yuan per person.

Finally, rows 27 and 28 generate the current account balance as described in blocks 27-32. The meanings of individual cells are as described on the spreadsheet and units are billions of current dollars.

The remainder of Table 3, rows 30-52, have the identical identifications as rows 6-28, except that the data are growth ratios over the base period (in this case 1983). Most of the growth ratios are set exogenously or by the model closing algorithm in spreadsheet FINAL. Several, however are endogenous. For details see blocks 8-32.

Table 4 presents the remainder of spreadsheet BALAN. Rows 55-76, again, are the identical entry definitions as in Table 3, except that the data here are from the base year, 1983. Rows 79-94 are from the COEFF spreadsheet for this year, rows 14-29. these data, combined with the growth ratios in rows 31-52

generate the model sectoral balance results in rows 7-28 (Table 3).

This completes the discussion of spreadsheet BALAN, presented in Tables 3 and 4. Its results and those of COEFF discussed above are used in the third spreadsheet, FLOWS, which generates value-added flows.

Table 5 presents spreadsheet FLOWS. The heart of the spreadsheet is rows 16-30, where value-added flows for both NMP and GDP are calculated, using four definitions, double-deflated, single-deflated, output-deflated, and current priced. In addition, dollar flows for NMP and GDP are estimated with both the output-deflated and current-priced definitions. For the formulae and meaning of these definitions see blocks 33-38 and the discussion of accounting relationships in the specification Report.

Rows 33-47 in spreadsheet FLOWS (Table 5) are growth ratios corresponding to the variables in rows 16-30, all of them endogenous. See blocks 33-38 for the mathematical specification.

The remaining rows in spreadsheet FLOWS (Table 5) are data loaded from other spreadsheets. Row 11 is gross value output from spreadsheet BALAN (Table 3), row 12. Rows 52-58 are the value-added coefficients from spreadsheet COEFF (Table 1) rows 35-41. Finally, rows 71-90 are data loaded from the FLOWS spreadsheet for the base year, in this case 1983. These data, together with coefficients loaded in rows 35-41, generate the value-added flows and the associated growth ratios.

This completes the discussion of the third modeling spreadsheet, FLOWS. The three first spreadsheets discussed so far, COEFF, BALAN, and FLOWS, are in themselves a complete model. If the modeler sets the exogoneous growth ratios and other parameters, these three spreadsheets will generate projections for each of the endogenous variables. However, the results may not be in accord with the modeler's own a priori beliefs or independent estimates of what they should. In technical terms, given the modeler's own understanding of the potential values for all the model variables, the model is over-specified and the over-specification results in contradictions pointed out by the model's accounting and technical relationships. In order to bring these contradictory projections into harmony which also conforms with the modeler's other independent understanding of the projections, a final model-closing algorithm is used in the last spreadsheet, called FINAL.

The final model-closing spreadsheet FINAL is presented in Table 6. Many of its parts are familiar from the spreadsheets COEFF and BALAN. In particular, rows 8-57 conform with rows 12-57 in spreadsheet BALAN, with a few deletions for simplification. These data represent the sectoral balances, projected, growth ratios, and base-year data . Rows 60-62, on the other hand, are shadow exchange rates and population projections from spreadsheet

Table 5

YEAR 2000 BASELINE VALUE-ADDED FLOW TABLE - CHINA MACRO MODEL

^LOADED FROM CURRENT YEAR GROSS VALUE OUTPUT TABLE:

	TG	OF	AM	PF	CF	EF	PM	AC	OV	PS	NS	TO
^Gross Value Output ('80 Prices)	135.0	262.9	397.0	278.2	534.4	165.9	490.9	141.1	715.9	850.4	676.2	4648.

^CALCULATED CURRENT YEAR VALUE-ADDED DATA:

^VALUE-ADDED FLOWS	TG	OF	AM	PF	CF	EF	PM	AC	OV	PS	NS	TO
^MMP D-Deflated (1980 Yuan)	67.60	87.31	157.1	46.22	191.6	76.19	178.6	49.45	296.1	81.47		1232.
^MMP S-Deflated (1980 Yuan)	52.21	126.2	123.9	39.48	132.4	96.61	149.2	71.19	203.6	218.6		1213.
^MMP O-Deflated (1980 Yuan)	52.98	128.1	125.8	40.07	134.4	98.05	151.5	72.25	206.6	221.8		1232.
^MMP Current-Priced (Yuan)	59.31	256.6	157.8	53.17	113.1	147.3	127.9	104.4	177.5	296.6		1494.
^MMP O-Deflated (1980 Dollars)	43.08	48.95	80.12	9.004	29.05	197.2	86.36	41.04	127.7	104.8		767.2
^MMP Current-Priced (Dollars)	39.37	69.68	97.45	9.798	37.26	214.1	84.68	37.20	106.0	135.5		830.9
^GDP D-Deflated (1980 Yuan)	68.00	88.09	158.5	47.90	197.2	84.03	191.9	52.34	312.5	119.7	125.0	1445.
^GDP S-Deflated (1980 Yuan)	52.55	126.6	124.9	40.69	138.8	101.6	164.3	73.09	221.9	245.9	289.6	1580.
^GDP O-Deflated (1980 Yuan)	48.07	115.8	114.3	37.22	127.0	92.98	150.3	66.86	203.0	224.9	264.9	1445.
^GDP Current-Priced (Yuan)	59.69	257.3	159.0	54.80	118.6	154.9	140.7	107.2	193.4	333.6	648.0	2227.
^GDP O-Deflated (1980 Dollars)	39.08	44.25	72.80	8.363	27.44	187.0	85.67	37.98	125.4	106.2	125.1	859.3
^GDP Current-Priced (Dollars)	35.72	62.99	88.54	9.101	35.21	203.0	84.00	34.43	104.1	137.3	136.1	930.5

*VALUE-ADDED GROWTH RATIOS

	TG	OF	AM	PF	CF	EF	PM	AC	OV	PS	NS	TO
*MMP D-Deflated (1980 Yuan)	.9311	1.308	2.997	1.819	3.788	2.263	4.470	15.59	5.120	1.686		2.733
*MMP S-Deflated (1980 Yuan)	.7301	1.801	2.506	1.537	2.777	2.767	3.893	14.39	3.807	3.751		2.671
*MMP O-Deflated (1980 Yuan)	.7470	1.843	2.564	1.572	2.841	2.831	3.983	14.72	3.896	3.838		2.733
*MMP Current-Priced (Yuan)	.7943	2.978	3.227	1.883	2.549	3.873	3.515	18.54	3.495	4.752		3.140
*MMP O-Deflated (1980 Dollars)	.7470	1.843	2.564	1.572	2.841	2.831	3.983	14.72	3.896	3.838		2.686
*MMP Current-Priced (Dollars)	.7470	2.580	3.035	1.730	3.364	3.646	3.656	16.86	3.701	4.544		3.065
*GDP D-Deflated (1980 Yuan)	.9330	1.314	3.008	1.852	3.780	2.283	4.469	14.99	5.111	2.173	4.593	2.906
*GDP S-Deflated (1980 Yuan)	.7321	1.801	2.514	1.560	2.812	2.692	3.966	14.00	3.900	3.813	9.267	3.133
*GDP O-Deflated (1980 Yuan)	.6790	1.670	2.331	1.446	2.608	2.496	3.678	12.98	3.617	3.536	8.594	2.906
*GDP Current-Priced (Yuan)	.7966	2.977	3.238	1.911	2.582	3.768	3.582	18.03	3.580	4.832	19.58	4.221
*GDP O-Deflated (1980 Dollars)	.6790	1.670	2.331	1.446	2.608	2.496	3.678	12.98	3.617	3.536	8.594	2.754
*GDP Current-Priced (Dollars)	.6790	2.338	2.760	1.591	3.088	3.215	3.377	14.87	3.436	4.187	8.723	3.125

%LOADED FROM COEFFICIENT SPREADSHEET:

%VALUE-ADDED COEFFICIENTS	TG	OF	AM	PF	CF	EF	PM	AC	OV	PS	NS	TO
%MMP D-Deflated (1980 Yuan)	.5006	.3321	.3959	.1661	.3585	.4588	.3639	.3506	.4136	.0958		
%MMP Current-Priced	.3866	.4802	.3122	.1419	.2478	.5825	.3040	.5047	.2844	.2570		
%GDP D-Deflated (1980 Yuan)	.5036	.3351	.3992	.1722	.3690	.5066	.3909	.3710	.4366	.1408	.1849	
%GDP Current-Priced	.3891	.4816	.3147	.1462	.2597	.6129	.3346	.5182	.3099	.2892	.4283	
%Domestic Pr Indx ('80 = 1)	1.136	2.033	1.273	1.347	.8545	1.524	.8566	1.466	.8718	1.357	2.238	.9682
%Dollar Pr Indx ('80 = 1)	.9139	1.423	1.216	1.088	1.283	1.086	.9805	.9065	.8300	1.293	1.088	.8179
%PP Par Ex Rt ('80 Y/Cur $)	1.346	1.839	1.291	4.090	3.607	.4580	1.789	1.942	1.950	1.638	1.946	0

-LOADED FROM PREVIOUS FLOW SPREADSHEET:

-VALUE-ADDED FLOWS (T-1)												
-MMP D-Deflated (1980 Yuan)	72.60	66.76	52.44	25.41	50.57	33.63	39.96	3.172	57.84	48.31		450.7
-MMP S-Deflated (1980 Yuan)	71.51	70.08	49.46	25.69	47.68	34.92	38.34	4.947	53.48	58.28		454.4
-MMP O-Deflated (1980 Yuan)	70.93	69.51	49.05	25.48	47.29	34.64	38.03	4.907	53.04	57.81		450.7
-MMP Current-Priced (Yuan)	74.66	86.17	48.89	28.25	44.38	38.02	36.37	5.631	50.78	62.41		475.6
-MMP O-Deflated (1980 Dollars)	57.67	26.56	31.25	5.726	10.22	69.65	21.68	2.787	32.77	27.30		285.6
-MMP Current-Priced (Dollars)	52.70	27.00	32.10	5.664	11.08	58.71	23.16	2.207	28.63	29.81		271.1
-GDP D-Deflated (1980 Yuan)	72.88	67.04	52.68	25.86	52.17	36.80	42.94	3.491	61.16	55.11	27.22	497.4
-GDP S-Deflated (1980 Yuan)	71.77	70.30	49.69	26.09	49.36	37.76	41.41	5.220	56.89	64.48	31.25	504.2
-GDP O-Deflated (1980 Yuan)	70.79	69.34	49.02	25.73	48.69	37.25	40.85	5.149	56.11	63.60	30.83	497.4
-GDP Current-Priced (Yuan)	74.94	86.45	49.12	28.68	45.95	41.11	39.29	5.942	54.02	69.05	33.10	527.6
-GDP O-Deflated (1980 Dollars)	57.56	26.50	31.23	5.782	10.52	74.90	23.29	2.925	34.67	30.04	14.56	312.0
-GDP Current-Priced (Dollars)	52.60	26.94	32.08	5.720	11.40	63.14	24.87	2.316	30.29	32.80	15.61	297.8

Table 6

YEAR 2000 BASELINE FINAL DEMAND ADJUSMENT TABLE - CHINA MACRO MODEL

	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO	
^SECTORAL BALANCES:													
^GVO (1980 Yuan)	135.0	262.9	397.0	278.2	534.4	165.86	490.9	141.1	715.9	850.4	676.2	4298.7	
^GDP Produced (1980 Yuan)	87.7	99.0	53.2	146.4	199.9	16.7	140.3	-1.3	15.9	401.0	418.7	1604.4	
^FOB Exports (1980 Yuan)	1.6	6.2	11.7	3.7	164.5	5.7	2.4	.0	6.6	.5	.1	202.4	
^Urban Per Cap. C. ('80 Y)	88.4	108.2	31.1	176.2	105.5	9.2	.1	.3	.0	171.0	617.7	1307.9	
^Rural Per Cap. C. ('80 Y)	84.0	58.9	39.9	69.4	18.7	4.9	.2	5.8	.0	17.9	112.3	411.8	
^GDP Consumption (1980 Yuan)	105.9	99.9	44.3	144.7	71.1	8.4	.2	4.1	.0	106.9	418.5	1004.0	
^GDP Investment (1980 Yuan)	.0	.0	.0	.0	.0	.0	175.9	.0	4.4	241.3	.0	421.6	
^FOB Imports (1980 Yuan)	20.2	7.7	9.5	2.2	44.5	3.6	59.6	5.4	30.9	.0	.0	183.5	

^CURRENT ACCOUNT AND DEBT:

		Exp: 85.2	Imp: 88.5
^Net Service Exports (Cur $)	.4	Commodity Trade Bal (Cur $)	-3.3
^Net In-Transfers (Cur $)	.5	Current Account Bal (Cur $)	-1.0
		Interest Earnings, Net (Cur $)	1.4
		Net Debt, Year-end (Cur $)	-9.6

	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
*SECTORAL BALANCES:												
*FOB Exports (1980 Yuan)	5.054	1.600	5.895	5.460	5.054	2.113	1.522	2.113	1.288	2.292	2.113	5.460
*FOB Exports (Cur. Dollars)												
*Urban Per Cap. C. ('80 Y)	1.042	1.350	.918	1.700	1.800	1.052	1.000	1.000	1.000	2.485	2.693	1.956
*Rural Per Cap. C. ('80 Y)	1.059	1.200	1.145	1.340	1.600	1.107	1.000	1.288	1.000	2.693	3.700	1.510
*GDP Consumption (1980 Yuan)												
*GDP Investment (1980 Yuan)	1.000	1.000	1.000	1.000	1.000	1.000	4.328	1.000	2.917	3.000	1.000	3.439
*FOB Imports (1980 Yuan)	4.328	1.948	3.159	2.292	5.5	60	6.8	3.419	3.159	1.288	1.4	4.4918
*FOB Imports (Cur. Dollars)												

*CURRENT ACCOUNT AND DEBT:

*Net Service Exports (Cur $)	2.579	Interest Earnings, Net (Cur $)	1.350
*Net In-Transfers (Cur $)	1.000	Interest Rate, (Decimal)	.140

	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO	
-SECTORAL BALANCES:													
-GVO (1980 Yuan)	103.2	101.9	83.4	79.5	169.7	69.690	121.3	17.6	156.1	169.3	87.8	1159.5	613.9
-GDP Produced (1980 Yuan)	77.2	56.7	34.0	64.0	47.0	8.1	33.6	2.0	-3.1	101.6	76.3	497.4	
-FOB Exports (1980 Yuan)	.3	3.9	2.0	.7	32.6	2.7	1.6	.0	5.1	.2	.1	48.8	
-FOB Exports (Cur. Dollars)	.6	3.4	1.4	.1	7.7	4.7	1.0	.0	3.5	.1	.0	22.2	
-Urban Per Cap. C. ('80 Y)	84.8	80.2	33.9	103.7	58.6	8.8	.1	.3	.0	68.8	229.4	668.5	
-Rural Per Cap. C. ('80 Y)	79.3	49.1	34.8	51.8	11.7	4.4	.2	4.5	.0	6.6	30.3	272.7	
-GDP Consumption (1980 Yuan)	81.5	56.8	35.0	64.3	22.5	5.4	.2	3.6	.0	20.9	76.2	366.5	
-NMP Investment (1980 Yuan)	.0	.0	.0	.0	.0	.0	40.6	.0	1.5	80.4	.0	122.6	
-FOB Imports (1980 Yuan)	4.7	4.0	3.0	.9	8.1	.1	8.8	1.6	9.8	.0	.0	40.8	
-FOB Imports (Cur. Dollars)	2.2	1.0	1.9	.2	1.9	.1	5.3	.7	4.4	.0	.0	17.6	

-CURRENT ACCOUNT AND DEBT:

-Net Service Exports (Cur $)	.1	Commodity Trade Bal (Cur $)	4.6
-Net In-Transfers (Cur $)	.5	Current Account Bal (Cur $)	6.3
		Interest Earnings, Net (Cur $)	1.0
		Net Debt, Year-end (Cur $)	-10.6

%MISCELLANEOUS DATA:

%Export Ex Rt ('80 Y/Cur $)	.545	.824	1.224	4.090	3.580	.449	1.779	1.858	1.560	1.638	1.946	.0
%Import Ex Rt ('80 Y/Cur $)	2.147	2.853	1.357	4.090	3.633	.467	1.799	2.027	2.340	1.638	1.946	
%Urban Population	554.4		Rural Population		677.5		Total Population		1232			

	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
^Demand Adjustment	-.3702	-.5486	-6.732	-.2106	-8.697	-6.109	-21.33	-.0030	-35.76	-52.34	-.0025	
-Economy-wide Input Effic'cy	.94573	.59235	.55348	.95893	1.6815	1.9793	1.3241	1.0392	.99120	1.1342	.53558	
^Effic Adj, 100% wt	.93840	.59038	.54285	.95740	1.6388	1.9015	1.2482	1.0391	.94302	1.0159	.53557	
^GVO gr rate, 100% wt	1.3047	2.5750	4.6804	3.4974	3.0972	2.2923	3.8711	7.9998	4.3573	4.7147	7.7000	
%Weight to Effic Adj	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
^^Effic Adj, mixed wt	.93840	.59038	.54285	.95740	1.6388	1.9015	1.2482	1.0391	.94302	1.0159	.53557	
^^GVO gr rate, mixed wt	1.3083	2.5804	4.7612	3.5	3.1484	2.38	4.0469	8	4.5865	5.0240	7.7	

COEFF. These are also familiar.

The final closing algorithm is found in rows 64-73 of the spreadsheet FINAL (Table 6). Its detailed specification is described in blocks 39-41 of the Specification Report. Row 64 is the demand adjustment requirment (block 39); it represents the degree of discrepency between the desired final demand pattern in rows 11-18 (of this spreadsheet FINAL) and GDP produced in row 9, which is loaded from spreadsheet BALAN, row 13. The values in row 64 approach zero as the model is closed to the satisfaction of the modeler.

Row 65 represents the current efficiency adjustment index (to the right of the equal sign in equation 40.1 of the Specification report). This row is loaded from spreadsheet COEFF, hence it is the efficiency adjustment index used to generate input-output coefficients used in turn to calculate GDP produced in row 9 of this FINAL spreadsheet.

Rows 67 and 68, in turn, are the calculated efficiency adjustment index orgrowth ratio of gross value output which will reconcile GDPproduced with the desired final demand components. In oher words, if the modeler were to reconcile the model only with a change in the efficiency adjustment index, row 67 gives the values that would be needed. If, on the other hand, the modeler wished to reconcile GDP produced and final demand by changing gross value output, row 68 shows the growth ratio which would be needed, to a linear approximation.

The two solutions in these rows 67 and 68 to reconciling GDP produced and final demand are in fact the solutions if the weights (see blocks 40 and 41) are either 1.0 or 0.0, respectively. The weights can also be anything in between as well. Once the weights are set, the new efficiency adjustment index and the new gross value output growth ratios are generated in lines 72 and 73.

These reconciling indexes and growth ratios are in turn loaded into the appropriate places in spreadsheets COEFF and BALAN, with the exception of the gross value output growth ratios for TG, OF and AW. For these, the modeler must make specific adjustments in the agricultural sub-model in the BALAN spreadsheet to generate the growth ratios desired. In practice, agriculture needs little adjustment compared to industry and other sectors.

In the spreadsheet shown in Table 6 the reconciliation has already been worked out, but if adjustments were made to the desired final demand growth ratios in the FINAL spreadsheet, the old GDP produced from the other spreadsheets would no longer be sufficient. Row 64 would no longer by zero, and the modeler would have to choose some combination of shifts in efficiency index and GVO growth ratios (or, or course, additional adjustments to final demand components).

The importance of this model closing algorithm is the ease with which differing a priori or independent estimates (over-specifications) of the model's variables can be brought into accord with one another. In other words, the model does not dictate the endogenous results to the modeler, the modeler dictates all results to the model, subject to the model's many checks for accounting, technical, and policy consistency. This flexibility is one of the great strengths of the Wharton China model.

This completes our discussion of the four modeling spreadsheets, COEFF, BALAN, FLOWS, and FINAL. Together they represent all equations in the Wharton China model. The section which follows will give a brief introduction to the execute commands (macros) which manipulate these spreadsheets and which together with the spreadsheets make up the model in its entirety.

INTRODUCTION TO MODELING EXECUTE COMMANDS (MACROS)

There are five (5) execute command macros used to run the four modeling spreadsheets introduced above. These are introduced briefly here. As above, each macro name stem is followed by the year and a letter, so that, for example, MODEL... could be MODEL83B for the 1983 baseline, or MODEL95H for the high 1995 scenario, or MODEL00L for the low scenario in the year 2000.

The five execute command macros are:

LOADS... is the first macro run if data in the base year have been changed. This macro loads base year data into each of the four modeling spreadsheets. It needs to be used only once. Other macros skip the loading steps, saving on execution time.

QUICK... runs a quick version of the model without using the closing algorithm or calculating value added flows. It uses only the COEFF and BALAN spreadsheets. QUICK... should be used when starting a new revision of a scenario so that efficiency adjustment coefficients and GVO growth ratios can be set to their new values before running FINAL's closing algorithm.

MODEL... is the basic modeling execute command macro. It steps through each of the spreadsheets in turn, loading the appropriate sections of each into the others. It loads the spreadsheets in this order: FINAL, COEFF, BALAN, and FLOWS, printing out the results for each spreadsheet. At each step, after the new data have been loaded into the spreadsheet, the macro pauses to allow the modeler to adjust coefficients and growth ratios. MODEL... should be used in the earlier iterations

of generating a scenario, when adjustments need to be made to final demand patterns (FINAL), to prices and population (COEFF), to the productivity adjustment index (COEFF), to exogenous input-output coefficient growth ratios (COEFF), to agriculture gross value output (BALAN), and to current account component variables (BALAN). After the model results are fairly well reconciled, so that only corrections in efficiency adjustment indexes, final demand patterns, and non-agricultural growth ratios are needed, the modeler may use SPEED... .

SPEED... is very similar to MODEL... above, except that it does not pause for adjustments or observation in COEFF, BALAN, or FLOWS. SPEED... pauses only for FINAL, with its model-closing algorithm. After first loading FINAL and entering the most recent data from the other spreadsheets (COEFF and BALAN), the macro pauses for the user to adjust final demand components and the weight allocating the demand adjustment to the efficiency adjustment index and GVO growth ratios. When these corrections have been made to the modeler's satisfaction, SPEED... runs the other spreadsheets, but without pausing for modeler intervention. It prints out all results. Typically, the modeler would run SPEED... several times as the last stages in scenario generation. When all weights are put to 1.0, SPEED... will automatically produce a perfectly reconciled set of projection variables.

Speed requires about 8 minutes to run on a 4 megaherz Z80 system. However, that time depends on having a printer buffer so that the computer can print and calculate at the same time. Without a buffer, turn-around time will be considerably slower while Supercalc2 waits for printing.

PRINT... is a utility macro for printing the results of all the modeling spreadsheets. It is configured to run on an Epson MX-80 or compatible printer. To run PRINT... or any of the other macros with a different printer, the user should use a text editor in its mode for editing programs and change the control codes following the output commands in each of the macros. These control codes are for generating compressed mode printing with Epson printers, allowing the model tables to fit on paper 8.5 inches wide.

This completes the introduction to the five principal execute command macros used to manipulate the model. A brief introductory example to running a scenario follows.

RUNNING A MODEL SCENARIO

We will assume that the user wishes to modify the baseline scenario for the year 2000. With a two-disk drive system, the Supercalc2 system diskette should be placed in drive A and the modeling spreadsheet diskette in drive B. The printer should be turned on and reset at the top of form. For a hard disk system, the spreadsheets need to be on the hard disk drive partition designated as drive B. The Supercalc2 and execute commands can be on any drive.

If the user wishes to put the modeling spreadsheets on some drive other than drive B, the execute command files must first be edited to replace all B: designations with the drive designation desired. This is very easy with the global "find and replace" features available in most word processors. Remember to use the editing mode for source programs (the "N" mode in Wordstar, for example) or else the resulting macro will not run.

The modeler should first call up Supercalc2 and enter a '/X ' command.

(1) If no changes have been made in the base-year data, this step can be skipped and the modeler can proceed directly to (2) below. If changes have been made in the base-year data, then the modeler shoud type

/XB:LOADS00B<cr>.

This will update the year 2000 baseline scenario with the new data from 1983. At the same time, the macro will step the modeler through the spreadsheets, giving a chance for changes in parameters. Until the modeler is more familiar with the process, it is best for the modeler to just hit '&' when the message "awaiting keyboard entry" appears on the screen.

(2) With base-year data now entered in the spreadsheets, the modeler should begin the modeling cycle by typing

/XB:QUICK00B<cr>

on the command line. As explained above in the introduction to execute command macros, QUICK00B will step the modeler through only the COEFF00B and BALAN00B spreadsheets. The COEFF spreadsheet is loaded first.

The modeler should window the screen horizontally with the /W command and then proceed to adjust all the desired parameters: (a) editing the exogenous growth ratios in the formulae for rows 14-24; (b) adjusting the price index growth ratios in rows 46-47; (c) setting cells in rows 48 and 49 all tc 1.0 as an initial condition; (d) setting urban and rural population growth ratios in row 65 (the total is endogenous). When these desired adjustments have been made,

the modeler should hit the '!' key to calculate, and the '&' to continue with the macro.

The second spreadsheet loaded by QUICKOOB will be BALANOOB. Here again, the modeler should make all the desired adjustments: (a) growth ratios for cultivated and planted areas in line 31; (b) growth ratios for animal husbandry, sidelines, and yields in row 32, and for marine products and forest products in line 33; (c) growth ratios for non-agricultural gross value output in row 36; and (d) growth ratios for net service exports, net in-transfers, and the interest rate in rows 51 and 52. The modeler should not set the final demand patterns at this time. They are better set in the closing algorithm of the FINALOOB spreadsheet, from which they will be automatically loaded into this BALANOOB spreadsheet. By hitting '&' the modeler will finish the QUICKOOB execute command macro, leaving a blank screen.

(3) With many of the basic parameters now set, the modeler should type

/XB:MODELOOB

for the most comprehensive modeling execute command macro. As explained above, this will first load the FINALOOB spreadsheet, and after pausing to set the date, a '&' key will position the modeler to set the model-closing algorithm. The modeler should first set the desired growth ratios for the final demand pattern in rows 25, 28, 29, 31, and 33. After calculating with '!', the modeler should examine lines 64-73 very carefully.

The entries in line 65 should all be 1.000, from the initial setting made in QUICKOOB, above. Because row 64 will most likely have many non-zero entries, the ideal efficiency adjustment indexes in row 67 will be very different from the current ones displayed in row 65 (all 1.000's). Similarly, the model reconciling growth ratios for GVO in row 68 will be very different from the current output growth ratios. (If all weights are set to 1.0 initially, these current growth ratios will appear in row 73.) The modeler must now change the final demand components and adjust the weights in row 70 so that the pattern of final demand, efficiency adjustment, and GVO growth ratio is acceptable in the modeler's judgement.

With these first-round adjustments completed, the modeler should type '&' and allow the macro to continue to the COEFFOOB and BALANOOB spreadsheets. Further adjustments here should follow the pattern for QUICKOOB, above.

(4) With the MODELOOB cycle completed, the modeler should now enter the comand

/XB:SPEEDOOB .

This will run the SPEEDOOB macro which, as described above, allows adjustments to FINALOB, after which it speeds through

the other spreadsheets without pausing for further corrections. At this point the modeler should want only to adjust the final demand patterns, the efficiency indexes, and the non-agricultural output growth ratios. If large changes are made in the output growth ratios, secondary changes in intermediate uses will keep the results from reconciling. In this case, SPEEDOOB should be run again, and possibly a third time. The results converge fairly quickly. When they are very close to the desired results, the demand adjustment requirements (row 64 in FINALOOB) can be "zeroed out" by setting all weights to 1.0. When this has been done, the scenario is completed and its results should already be printing out.

This completes the brief user's guide to the Wharton macroeconomy model. It is not meant to be a tutorial for Supercalc2, and the modeler should be thoroughly familiar with the Supercalc2 spreadsheet and its execute commands to make fullest use of the Wharton model.

17-YEAR GROWTH RATIOS AND ANNUAL AVERAGE

Annual Average Growth Ratio	17 Year Growth Ratio	Annual Average Growth Ratio	17 Year Growth Ratio	Annual Average Growth Ratio	17 Year Growth Ratio	Annual Average Growth Ratio	17 Year Growth Ratio	Annual Average Growth Ratio	17 Year Growth Ratio
.900	.167	.951	.426	1.000	1.000	1.050	2.292	1.100	5.054
.901	.170	.952	.433	1.001	1.017	1.051	2.329	1.101	5.133
.902	.173	.953	.441	1.002	1.035	1.052	2.367	1.102	5.213
.903	.176	.954	.449	1.003	1.052	1.053	2.406	1.103	5.294
.904	.180	.955	.457	1.004	1.070	1.054	2.445	1.104	5.376
.905	.183	.956	.465	1.005	1.088	1.055	2.485	1.105	5.460
.906	.187	.957	.474	1.006	1.107	1.056	2.525	1.106	5.544
.907	.190	.958	.482	1.007	1.126	1.057	2.566	1.107	5.630
.908	.194	.959	.491	1.008	1.145	1.058	2.608	1.108	5.717
.909	.198	.960	.500	1.009	1.165	1.059	2.650	1.109	5.805
.910	.201	.961	.509	1.010	1.184	1.060	2.693	1.110	5.895
.911	.205	.962	.519	1.011	1.204	1.061	2.736	1.111	5.986
.912	.209	.963	.527	1.012	1.225	1.062	2.780	1.112	6.078
.913	.213	.964	.536	1.013	1.246	1.063	2.825	1.113	6.172
.914	.217	.965	.546	1.014	1.267	1.064	2.871	1.114	6.267
.915	.221	.966	.555	1.015	1.288	1.065	2.917	1.115	6.363
.916	.225	.967	.565	1.016	1.310	1.066	2.964	1.116	6.461
.917	.229	.968	.575	1.017	1.332	1.067	3.012	1.117	6.560
.918	.234	.969	.585	1.018	1.354	1.068	3.060	1.118	6.661
.919	.238	.970	.596	1.019	1.377	1.069	3.109	1.119	6.763
.920	.242	.971	.606	1.020	1.400	1.070	3.159	1.120	6.866
.921	.247	.972	.617	1.021	1.424	1.071	3.209	1.121	6.971
.922	.251	.973	.628	1.022	1.448	1.072	3.261	1.122	7.077
.923	.256	.974	.639	1.023	1.472	1.073	3.313	1.123	7.185
.924	.261	.975	.650	1.024	1.497	1.074	3.366	1.124	7.295
.925	.266	.976	.662	1.025	1.522	1.075	3.419	1.125	7.406
.926	.271	.977	.673	1.026	1.547	1.076	3.474	1.126	7.519
.927	.276	.978	.685	1.027	1.573	1.077	3.529	1.127	7.633
.928	.281	.979	.697	1.028	1.599	1.078	3.585	1.128	7.749
.929	.286	.980	.709	1.029	1.626	1.079	3.642	1.129	7.867
.930	.291	.981	.722	1.030	1.653	1.080	3.700	1.130	7.986
.931	.297	.982	.734	1.031	1.680	1.081	3.759	1.131	8.107
.932	.302	.983	.747	1.032	1.708	1.082	3.818	1.132	8.230
.933	.308	.984	.760	1.033	1.737	1.083	3.879	1.133	8.354
.934	.313	.985	.773	1.034	1.765	1.084	3.940	1.134	8.481
.935	.319	.986	.787	1.035	1.795	1.085	4.002	1.135	8.609
.936	.325	.987	.801	1.036	1.824	1.086	4.065	1.136	8.738
.937	.331	.988	.814	1.037	1.855	1.087	4.130	1.137	8.870
.938	.337	.989	.829	1.038	1.885	1.088	4.195	1.138	9.004
.939	.343	.990	.843	1.039	1.916	1.089	4.261	1.139	9.139
.940	.349	.991	.858	1.040	1.948	1.090	4.328	1.140	9.276
.941	.356	.992	.872	1.041	1.980	1.091	4.396	1.141	9.416
.942	.362	.993	.887	1.042	2.013	1.092	4.465	1.142	9.557
.943	.369	.994	.903	1.043	2.046	1.093	4.535	1.143	9.700
.944	.375	.995	.918	1.044	2.079	1.094	4.606	1.144	9.846
.945	.382	.996	.934	1.045	2.113	1.095	4.678	1.145	9.993
.946	.389	.997	.950	1.046	2.148	1.096	4.751	1.146	10.142
.947	.396	.998	.967	1.047	2.183	1.097	4.825	1.147	10.294
.948	.403	.999	.983	1.048	2.219	1.098	4.900	1.148	10.447
.949	.411	1.000	1.000	1.049	2.255	1.099	4.977	1.149	10.603
.950	.418	1.001	1.017	1.050	2.292	1.100	5.054	1.150	10.761

Wharton

Econometric Forecasting Associates

China

Macroeconomic Model

SCENARIO REPORT

U.S. Department of State

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CHINA MODEL SCENARIO REPORT

INTRODUCTION

The Wharton China model can be used to make alternative scenario projections of the Chinese economy in any year. For this report, three scenarios for the year 2000 have been made. These three scenarios will be referred to as the baseline, high, and low scenarios. This report presents the projections and discusses their economic implications.

The presentation follows the format given in the Specification Report and the User's Guide by examining each scenario in light of the three major spreadsheets which make up the model, COEFF, BALAN, and FLOWS. The reader should not continue without first carefully studying the Specification Report and the User's Guide.

In general, the three scenarios present contrasting pictures of China in the year 2000. The baseline is a fairly realistic assessment of the most likely characteristics of the Chinese economy by that time. The high scenario describes an economy in very rapid, almost "miracle" growth. And the low scenario presents a large economy in deep trouble from failed reforms and an adverse world economic environment. It should be stressed that these scenarios are only illustrative of the many possible patterns of economic evolution for China. As illustrations, however, they do show the range of potential for the economy as well as the flexibility of the model in describing that range.

To summarize, the baseline scenario describes an economy with average real GDP growth of just under 6.5 percent over the seventeen years between 1983 and 2000. Overall population growth will have been kept at 1.1 percent annual growth overall, with 45 percent of the population urbanized. Urban and rural per-capita consumption will have on average grown by 4.0 and 2.5 percent respectively. Commodity trade in current dollars will be in slight deficit, but because of favorable invisible flows, the current account is almost

in balance. The overall pattern is one of acceleration from China's record over recent decades, but not unreasonably so.

The high scenario describes an economy in even more rapid expansion. Real GDP will have averaged 7.6 percent, while population will have grown at just under 1.0 percent per year. The urban population will make up just over half the population (50.7 percent), and urban and rural real consumption will have averaged 4.8 and 4.6 percent growth, respectively. Both commodity trade and the current account would be in strong surplus, largely due to export earnings from energy and consumer manufactures. In short, the economy and trade will be booming.

The low scenario, however, presents an economy with considerable difficulties, in spite of overall GDP growth throughout the period averaging just less than 4.7 percent while population grew at 1.4 percent. With less than 40 percent of the population urbanized, per capita consumption will have grown only 1.8 percent in the cities and virtually stagnated in rural areas, averaging less than 0.6 percent per year. The low growth in consumption with such respectable output expansion is due to higher investment shares in demand, and very unfavorable international terms of trade, requiring China to expend considerably more domestic resources to earn the foreign exchange necessary to pay for large grain and energy imports. These terms of trade would be in part due to the poor quality of Chinese consumer manufactures exports.

None of these scenarios is a disaster scenario, but the low scenario presents a realistic picture of some of the difficulties China might face. For more detailed descriptions and comparisons of these scenarios, refer to the discussion organized by spreadsheet in the main body of the report.

NOTATION AND GROWTH RATIOS

The notation used in the presentation below follows the notation presented in the Specification Report. The reader should be familiar with both the Specification Report and the User's Guide.

In addition, a notation describing locations on individual spreadsheets will be used. The notation is standard for most spreadsheets, in that each cell is given a name representing the coordinates in letters and numbers. Referring to the spreadsheets below, notice that there are letters from A to N along the top of each spreadsheet designating each column. Furthermore, the left-hand edge of each spreadsheet has integers numbering the rows. With these letter and number designations, any location on the spreadsheet can be given a combination, such as B12, or G57. Throughout the discussion below the text will refer to "cell K22" or "cell E64." The reader should be able to find the number under discussion with no difficulty.

In addition to notational conventions, the spreadsheets make use of "growth ratios" rather than growth rates. These are explained briefly here, and a reference table is included below.

To simplify formulae and speed calculation, a growth "ratio" such as 1.047 or .975 is used instead of the corresponding growth rate, which would be 4.7 percent, or -2.5 percent, respectively. The growth ratio of some change is just the ratio of the later number divided by the earlier number. This presents no difficulty for changes over a one-year period.

For changes over more than one year, the growth ratio reflects the overall change, not the annual average. In the scenarios presented below, the time period is 17 years, from 1983 to 2000. In this case, an overall growth ratio of, say, 1.522 would mean that the year-2000 variable was 1.522 times as great as the same variable in 1983. Over a 17-year period, this would mean 2.5 percent average annual growth, or an annual growth ratio of 1.025.

In order to interpret the model and influence its results, the modeler needs to know the annual average growth ratios associated

17-YEAR GROWTH RATIOS AND ANNUAL AVERAGE

Annual Average Growth Ratio	17 Year Growth Ratio	Annual Average Growth Ratio	17 Year Growth Ratio	Annual Average Growth Ratio	17 Year Growth Ratio	Annual Average Growth Ratio	17 Year Growth Ratio	Annual Average Growth Ratio	17 Year Growth Ratio
.900	.167	.951	.426	1.000	1.000	1.050	2.292	1.100	5.054
.901	.170	.952	.433	1.001	1.017	1.051	2.329	1.101	5.133
.902	.173	.953	.441	1.002	1.035	1.052	2.367	1.102	5.213
.903	.176	.954	.449	1.003	1.052	1.053	2.406	1.103	5.294
.904	.180	.955	.457	1.004	1.070	1.054	2.445	1.104	5.376
.905	.183	.956	.465	1.005	1.088	1.055	2.485	1.105	5.460
.906	.187	.957	.474	1.006	1.107	1.056	2.525	1.106	5.544
.907	.190	.958	.482	1.007	1.126	1.057	2.566	1.107	5.630
.908	.194	.959	.491	1.008	1.145	1.058	2.608	1.108	5.717
.909	.198	.960	.500	1.009	1.165	1.059	2.650	1.109	5.805
.910	.201	.961	.509	1.010	1.184	1.060	2.693	1.110	5.895
.911	.205	.962	.518	1.011	1.204	1.061	2.736	1.111	5.986
.912	.209	.963	.527	1.012	1.225	1.062	2.780	1.112	6.078
.913	.213	.964	.536	1.013	1.246	1.063	2.825	1.113	6.172
.914	.217	.965	.546	1.014	1.267	1.064	2.871	1.114	6.267
.915	.221	.966	.555	1.015	1.288	1.065	2.917	1.115	6.363
.916	.225	.967	.565	1.016	1.310	1.066	2.964	1.116	6.461
.917	.229	.968	.575	1.017	1.332	1.067	3.012	1.117	6.560
.918	.234	.969	.585	1.018	1.354	1.068	3.060	1.118	6.661
.919	.238	.970	.596	1.019	1.377	1.069	3.109	1.119	6.763
.920	.242	.971	.606	1.020	1.400	1.070	3.159	1.120	6.866
.921	.247	.972	.617	1.021	1.424	1.071	3.209	1.121	6.971
.922	.251	.973	.628	1.022	1.448	1.072	3.261	1.122	7.077
.923	.256	.974	.639	1.023	1.472	1.073	3.313	1.123	7.185
.924	.261	.975	.650	1.024	1.497	1.074	3.366	1.124	7.295
.925	.266	.976	.662	1.025	1.522	1.075	3.419	1.125	7.406
.926	.271	.977	.673	1.026	1.547	1.076	3.474	1.126	7.519
.927	.276	.978	.685	1.027	1.573	1.077	3.529	1.127	7.633
.928	.281	.979	.697	1.028	1.599	1.078	3.585	1.128	7.749
.929	.286	.980	.709	1.029	1.626	1.079	3.642	1.129	7.867
.930	.291	.981	.722	1.030	1.653	1.080	3.700	1.130	7.986
.931	.297	.982	.734	1.031	1.680	1.081	3.759	1.131	8.107
.932	.302	.983	.747	1.032	1.708	1.082	3.818	1.132	8.230
.933	.308	.984	.760	1.033	1.737	1.083	3.879	1.133	8.354
.934	.313	.985	.773	1.034	1.765	1.084	3.940	1.134	8.481
.935	.319	.986	.787	1.035	1.795	1.085	4.002	1.135	8.609
.936	.325	.987	.801	1.036	1.824	1.086	4.065	1.136	8.738
.937	.331	.988	.814	1.037	1.855	1.087	4.130	1.137	8.870
.938	.337	.989	.829	1.038	1.885	1.088	4.195	1.138	9.004
.939	.343	.990	.843	1.039	1.916	1.089	4.261	1.139	9.139
.940	.349	.991	.858	1.040	1.948	1.090	4.328	1.140	9.276
.941	.356	.992	.872	1.041	1.980	1.091	4.396	1.141	9.416
.942	.362	.993	.887	1.042	2.013	1.092	4.465	1.142	9.557
.943	.369	.994	.903	1.043	2.046	1.093	4.535	1.143	9.700
.944	.375	.995	.918	1.044	2.079	1.094	4.606	1.144	9.846
.945	.382	.996	.934	1.045	2.113	1.095	4.678	1.145	9.993
.946	.389	.997	.950	1.046	2.148	1.096	4.751	1.146	10.142
.947	.396	.998	.967	1.047	2.183	1.097	4.825	1.147	10.294
.948	.403	.999	.983	1.048	2.219	1.098	4.900	1.148	10.447
.949	.411	1.000	1.000	1.049	2.255	1.099	4.977	1.149	10.603
.950	.418	1.001	1.017	1.050	2.292	1.100	5.054	1.150	10.761

with 17-year growth ratios. For example, a 17-year growth ratio of 2.608 is equivalent to an annual average ratio of 1.058. In mathematical terms, the former is the latter raised to the 17th power.

The table included above called "17-Year Growth Ratios and Annual Average" presents these correspondences for annual growth ratios from .950 to 1.150, that is from -5.0 percent to 15.0 percent. It should be used as a reference when considering the many 17-year growth ratios in the model results.

This completes the brief introduction to the notation and growth ratios used in the subsequent presentation. Again, the reader is strongly encouraged to study and become familiar with the notation, specifications, and spreadsheet lay-outs in the Specification Report and User's Guide.

The presentation of the three scenarios below is organized by spreadsheets rather than by scenarios. Hence, the sections are entitled "Prices and Coefficients," "Sectoral Balances," and "Value-Added Flows." Under these headings, the differences in assumptions and results of all three scenarios are discussed together.

SCENARIO PRICES AND COEFFICIENTS

The scenario results for the first spreadsheet are presented in Tables 1-B, 1-H, and 1-L below with data on the baseline, high, and low projections of prices, population, input-output coefficients and value-added coefficients.

PRICES:

Differences in assumptions about price changes to the year 2000 appear in rows 11 and 12. To mention a few of the more significant differences, the domestic price of grains in cell C11 is much more favorable to rural areas in the high and baseline scenarios than in

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2					Table 1-B									
3														
4					YEAR 2000 BASELINE COEFFICIENT TABLE - CHINA MACRO MODEL									
5														
6														
7	==========													
8	^CALCULATED CURRENT YEAR COEFFICIENTS:													
9	----------													
10	^PRICE INDEXES:		TG	DF	AW	PF	CF	EF	PM	AC	DV	PS	NS	CC
11	^Domestic Pr Indx ('80 = 1)		1.136	2.033	1.273	1.347	.855	1.524	.857	1.466	.872	1.357	2.238	.968
12	^Dol. Price Index ('80 = 1)		.914	1.423	1.216	1.086	1.283	1.086	.980	.906	.830	1.293	1.088	.818
13	^I-O COEFF. '80 PRICES:													
14	^Total Grains --> ...		.100	.017	.025	.059	.000	.000	.000	.001	.002	.002	.000	
15	^Other Foods --> ...		.073	.250	.106	.149	.000	.000	.000	.001	.003	.003	.000	
16	^Agricul. Raw. Mat. --> ...		.064	.168	.250	.092	.153	.000	.002	.001	.075	.042	.000	
17	^Processed Foods --> ...		.022	.035	.003	.359	.001	.000	.000	.033	.013	.001	.005	
18	^Consumer Manuf. --> ...		.000	.000	.000	.009	.298	.003	.038	.017	.014	.054	.154	
19	^Energy and Fuels --> ...		.023	.026	.007	.010	.011	.176	.017	.035	.039	.038	.045	
20	^Producer Machinery --> ...		.039	.027	.014	.013	.036	.064	.276	.016	.044	.137	.051	
21	^Agricultural Chem. --> ...		.156	.121	.183	.000	.000	.000	.000	.120	.000	.000	.000	
22	^Other Heavy Indus. --> ...		.006	.007	.004	.082	.093	.155	.210	.309	.280	.228	.137	
23	^Other Prod. Sectors --> ...		.013	.014	.009	.054	.038	.095	.065	.098	.093	.354	.042	
24	^Non-Prod. Services --> ...		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.381	
25	^MISCELLANEOUS DATA:													
26	^Depreciation Coefficients		.003	.003	.003	.006	.011	.048	.027	.020	.023	.045	.022	
27	^Export Ex Rt ('80 Y/Cur $)		.545	.824	1.224	4.090	3.580	.449	1.779	1.858	1.560	1.638	1.946	
28	^Import Ex Rt ('80 Y/Cur $)		2.147	2.853	1.357	4.090	3.633	.467	1.799	2.027	2.340	1.638	1.946	
29	^Urban Population		554.4		Rural Populat		677.5		Total Populati		1232			
30	^PF Par Ex Rt ('80 Y/Cur $)		1.346	1.839	1.291	4.090	3.607	.458	1.789	1.942	1.950	1.638	1.946	.000
31	----------													
32	\Exchange Rate (Cur Y/Cur $)		1.529	3.737	1.643	5.508	3.082	.698	1.532	2.847	1.700	2.222	4.355	.000
33	----------													
34	=VALUE-ADDED COEFFICIENTS:		TG	DF	AW	PF	CF	EF	PM	AC	DV	PS	NS	
35	=NMP D-Deflated (1980 Yuan)		.501	.332	.396	.166	.356	.459	.364	.351	.414	.096		
36	=NMP Current-Priced		.387	.486	.312	.142	.248	.582	.304	.505	.264	.257		
37	=GDP D-Deflated (1980 Yuan)		.504	.335	.399	.172	.369	.507	.391	.371	.437	.141	.185	
38	=GDP Current-Priced		.389	.482	.315	.146	.266	.613	.335	.518	.310	.289	.428	
39	=Domestic Pr Indx ('80 = 1)		1.136	2.033	1.273	1.347	.855	1.524	.857	1.466	.872	1.357	2.238	.968
40	=Dollar Pr Indx ('80 = 1)		.914	1.423	1.216	1.086	1.283	1.086	.980	.906	.830	1.293	1.086	.818
41	=PF Par Ex Rt ('80 Y/Cur $)		1.346	1.839	1.291	4.090	3.607	.458	1.789	1.942	1.950	1.638	1.946	.000
42	==========													
43	#GROWTH RATIOS:													
44	----------													
45	#MISCELLANEOUS VARIABLES:		TG	DF	AW	PF	CF	EF	PM	AC	DV	PS	NS	
46	#Domestic Pr Indx ('80 = 1)		1.088	1.653	1.286	1.225	.918	1.400	.903	1.288	.918	1.267	2.113	.992
47	#Dol. Price Index ('80 = 1)		1.000	1.400	1.184	1.100	1.184	1.288	.918	1.145	.950	1.164	1.015	.892
48	#Disembodied Productivity		1.050	.995	1.522	1.010	1.015	1.005	1.010	1.005	1.020	.995	.965	
49	#Economy-wide Input Efficiency		.9384	.5904	.5426	.9574	1.639	1.901	1.248	1.039	.9430	1.016	.5356	
50	#I-O COEFFICIENTS GROWTH:													
51	#Total Grains --> ...		1.066	1.071	.700	.422	1.050	1.060	1.055	1.060	1.045	1.071	1.104	
52	#Other Foods --> ...		1.613	1.787	1.113	.671	1.669	1.685	1.677	1.685	1.661	1.702	1.755	
53	#Agricul. Raw. Mat. --> ...		1.754	1.851	1.937	1.824	2.359	1.833	1.824	1.833	1.806	1.851	1.909	
54	#Processed Foods --> ...		.995	1.050	.686	4.654	1.029	1.039	1.034	1.039	1.024	1.050	1.062	
55	#Consumer Manuf. --> ...		.581	.613	.401	.604	.691	.607	.604	.607	.598	.613	.632	
56	#Energy and Fuels --> ...		10.02	10.57	3.455	.521	.518	.628	.521	.785	.516	.529	.545	
57	#Producer Machinery --> ...		2.289	2.416	.790	.793	.789	1.594	1.190	.797	.785	.805	.830	
58	#Agricultural Chem. --> ...		2.750	4.352	2.845	.953	.948	.955	.953	1.341	.943	.967	.997	
59	#Other Heavy Indus. --> ...		1.010	1.066	.697	1.050	1.045	3.165	.840	.633	.936	1.066	1.099	
60	#Other Prod. Sectors --> ...		.938	.989	.647	.975	.970	.979	.975	.979	.965	3.463	1.020	
61	#Non-Prod. Services --> ...		1.778	1.877	1.227	1.849	1.849	1.858	1.849	1.858	1.831	1.877	2.902	
62	#Depreciation Coef.('80 Y)		1.090	1.090	1.150	1.070	1.120	1.050	1.100	1.130	1.080	1.120	1.090	
63	#Export Ex Rt ('80 Y/Cur $)		1.000	.714	.845	.909	.845	.776	1.089	.873	1.053	.845	.985	
64	#Import Ex Rt ('80 Y/Cur $)		1.000	.714	.845	.909	.845	.776	1.089	.873	1.053	.845	.985	
65	#Urban Population		2.424		Rural Populat		.865		Total Populati		1.217			
66	#PF Par Ex Rt ('80 Y/Cur $)		1.000	.714	.845	.909	.845	.776	1.089	.873	1.053	.845	.985	
67	==========													

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2					Table 1-H									
3														
4					YEAR 2000 HIGH SCENARIO COEFFICIENT TABLE - CHINA MACRO MODEL									
5														
6														
7	==========													
8	^CALCULATED CURRENT YEAR COEFFICIENTS:													
9	----------													
10	^PRICE INDEXES:		TG	DF	AN	PF	CF	EF	PM	AC	DV	PS	NS	CC
11	^Domestic Pr Indx ('80 = 1)		1.236	2.207	1.384	1.646	.785	1.800	.733	1.238	.801	1.206	1.901	.851
12	^Dol. Price Index ('80 = 1)		.839	1.106	1.323	1.212	1.350	1.180	.826	.847	.802	1.020	1.428	.773
13	^I-O COEFF. '80 PRICES:													
14	^Total Grains --> ...		.086	.055	.031	.061	.000	.000	.000	.001	.002	.002	.000	
15	^Other Foods --> ...		.069	.274	.115	.139	.000	.000	.000	.001	.004	.003	.000	
16	^Agricul. Raw. Mat. --> ...		.066	.148	.225	.071	.141	.000	.003	.000	.084	.044	.000	
17	^Processed Foods --> ...		.022	.029	.002	.355	.001	.000	.000	.040	.015	.001	.006	
18	^Consumer Manuf. --> ...		.000	.000	.000	.008	.316	.004	.036	.020	.011	.034	.173	
19	^Energy and Fuels --> ...		.028	.032	.009	.011	.012	.180	.019	.044	.035	.035	.061	
20	^Producer Machinery --> ...		.042	.032	.016	.013	.033	.079	.298	.021	.050	.141	.062	
21	^Agricultural Chem. --> ...		.182	.153	.206	.000	.000	.000	.000	.157	.000	.000	.000	
22	^Other Heavy Indus. --> ...		.005	.006	.003	.069	.092	.177	.187	.299	.291	.210	.158	
23	^Other Prod. Sectors --> ...		.014	.015	.010	.041	.034	.116	.063	.108	.094	.349	.048	
24	^Non-Prod. Services --> ...		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.305	
25	^MISCELLANEOUS DATA:													
26	^Depreciation Coefficients		.003	.003	.003	.006	.011	.049	.028	.022	.024	.047	.024	
27	^Export Ex Rt ('80 Y/Cur $)		.594	1.061	1.125	3.672	3.402	.413	2.112	1.988	1.615	2.076	1.483	
28	^Import Ex Rt ('80 Y/Cur $)		2.339	3.671	1.248	3.672	3.452	.429	2.137	2.169	2.421	2.076	1.483	
29	^Urban Population		606.7		Rural Populat		590.7		Total Populati		1197			
30	^PP Par Ex Rt ('80 Y/Cur $)		1.466	2.366	1.186	3.672	3.427	.421	2.124	2.078	2.018	2.076	1.483	.000
31	----------													
32	\Exchange Rate (Cur Y/Cur $)		1.812	5.222	1.642	6.044	2.689	.758	1.558	2.574	1.616	2.503	2.819	.000
33	----------													
34	=VALUE-ADDED COEFFICIENTS:		TG	DF	AN	PF	CF	EF	PM	AC	DV	PS	NS	
35	=NMF D-Deflated (1980 Yuan)		.482	.252	.377	.226	.360	.394	.366	.289	.389	.134		
36	=NMF Current-Priced		.420	.446	.342	.264	.216	.606	.271	.386	.216	.259		
37	=GDP D-Deflated (1980 Yuan)		.485	.255	.380	.232	.371	.443	.394	.310	.414	.181	.186	
38	=GDP Current-Priced		.422	.447	.344	.268	.228	.629	.303	.401	.242	.292	.439	
39	=Domestic Pr Indx ('80 = 1)		1.236	2.207	1.384	1.646	.785	1.800	.733	1.238	.801	1.206	1.901	.851
40	=Dollar Pr Indx ('80 = 1)		.839	1.106	1.323	1.212	1.350	1.180	.826	.847	.802	1.020	1.428	.773
41	=PP Par Ex Rt ('80 Y/Cur $)		1.466	2.366	1.186	3.672	3.427	.421	2.124	2.078	2.018	2.076	1.483	.000
42	==========													
43	#GROWTH RATIOS:													
44	----------													
45	#MISCELLANEOUS VARIABLES:		TG	DF	AN	PF	CF	EF	PM	AC	DV	PS	NS	
46	#Domestic Pr Indx ('80 = 1)		1.184	1.795	1.400	1.497	.843	1.653	.773	1.088	.843	1.126	1.795	.872
47	#Dol. Price Index ('80 = 1)		.918	1.088	1.288	1.225	1.246	1.400	.773	1.070	.918	.934	1.332	.843
48	#Disembodied Productivity		1.000	1.000	1.000	1.202	1.031	.843	.963	.830	.914	1.053	.709	
49	#Economy-wide Input Efficiency		1.144	.9947	.9196	.9572	.9934	1.054	1.055	.9971	1.081	1.085	1.515	
50	#I-O COEFFICIENTS GROWTH:													
51	#Total Grains --> ...		.918	3.524	.874	.437	.891	1.037	.908	1.053	.957	.831	1.233	
52	#Other Foods --> ...		1.508	1.960	1.206	.627	1.629	1.193	1.044	1.211	1.760	1.624	1.418	
53	#Agricul. Raw. Mat. --> ...		1.794	1.631	1.740	1.402	2.163	1.290	2.033	1.310	2.023	1.963	1.534	
54	#Processed Foods --> ...		1.013	.888	.721	4.607	1.044	1.239	1.085	1.259	1.143	.993	1.474	
55	#Consumer Manuf. --> ...		.584	.614	.403	.503	.734	.681	.575	.728	.496	.383	.710	
56	#Energy and Fuels --> ...		12.34	12.81	4.746	.553	.553	.642	.592	.972	.467	.478	.736	
57	#Producer Machinery --> ...		2.465	2.845	.901	.749	.726	1.968	1.280	1.028	.892	.829	1.003	
58	#Agricultural Chem. --> ...		3.209	5.516	3.209	.793	.923	1.140	1.042	1.752	1.032	.953	1.415	
59	#Other Heavy Indus. --> ...		.925	.990	.648	.885	1.033	3.622	.750	.613	.972	.985	1.266	
60	#Other Prod. Sectors --> ...		1.014	1.014	.738	.748	.868	1.203	.939	1.089	.979	3.416	1.170	
61	#Non-Prod. Services --> ...		1.188	1.241	.812	1.015	1.178	1.456	.685	1.511	1.300	.627	2.327	
62	#Depreciation Coef.('80 Y)		1.130	1.100	1.200	1.100	1.170	1.080	1.130	1.200	1.150	1.160	1.160	
63	#Export Ex Rt ('80 Y/Cur $)		1.089	.919	.776	.816	.803	.714	1.294	.935	1.089	1.071	.751	
64	#Import Ex Rt ('80 Y/Cur $)		1.089	.919	.776	.816	.803	.714	1.294	.935	1.089	1.071	.751	
65	#Urban Population		2.653		Rural Populat		.754		Total Populati		1.183			
66	#PP Par Ex Rt ('80 Y/Cur $)		1.089	.919	.776	.816	.803	.714	1.294	.935	1.089	1.071	.751	
67	==========													

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2					Table 1-L									
3														
4			YEAR 2000 LOW SCENARIO COEFFICIENT TABLE - CHINA MACRO MODEL											
5														
6														
7	==========													
8	^CALCULATED CURRENT YEAR COEFFICIENTS:													
9	----------													
10	^PRICE INDEXES:		TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	CC
11	^Domestic Pr Indx ('80 = 1)		1.098	1.872	1.094	1.176	.963	1.311	.982	1.594	.966	1.426	2.386	1.027
12	^Dol. Price Index (80 = 1)		.946	1.522	1.045	1.041	1.220	.933	1.105	.986	.859	1.315	1.036	.910
13	^I-O COEFF. '80 PRICES:													
14	^Total Grains --> ...		.101	.015	.024	.055	.000	.000	.000	.001	.002	.002	.000	
15	^Other Foods --> ...		.071	.211	.092	.129	.000	.000	.000	.000	.002	.003	.000	
16	^Agricul. Raw. Mat. --> ...		.063	.166	.253	.092	.155	.000	.001	.000	.064	.041	.000	
17	^Processed Foods --> ...		.020	.034	.003	.289	.001	.000	.000	.028	.012	.001	.004	
18	^Consumer Manuf. --> ...		.000	.000	.000	.005	.278	.005	.042	.015	.015	.049	.167	
19	^Energy and Fuels --> ...		.020	.020	.006	.010	.011	.215	.017	.034	.046	.039	.046	
20	^Producer Machinery --> ...		.033	.024	.014	.014	.038	.064	.265	.016	.043	.145	.057	
21	^Agricultural Chem. --> ...		.133	.109	.151	.000	.000	.000	.000	.122	.000	.000	.000	
22	^Other Heavy Indus. --> ...		.005	.006	.003	.073	.090	.133	.203	.274	.252	.198	.132	
23	^Other Prod. Sectors --> ...		.010	.012	.007	.047	.062	.082	.057	.087	.084	.258	.043	
24	^Non-Prod. Services --> ...		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.406	
25	^MISCELLANEOUS DATA:													
26	^Depreciation Coefficients		.002	.003	.003	.006	.010	.048	.027	.020	.023	.044	.022	
27	^Export Ex Rt (80 Y/Cur $)		.526	.771	1.425	4.276	3.765	.523	1.577	1.707	1.508	1.610	2.043	
28	^Import Ex Rt ('80 Y/Cur $)		2.074	2.668	1.580	4.276	3.820	.543	1.596	1.862	2.261	1.611	2.043	
29	^Urban Population		507.5		Rural Populat		770.1		Total Populati		1278			
30	^PP Par Ex Rt ('80 Y/Cur $)		1.300	1.719	1.502	4.276	3.792	.533	1.587	1.785	1.885	1.610	2.043	.000
31	----------													
32	\Exchange Rate (Cur Y/Cur $)		1.428	3.218	1.644	5.031	3.654	.699	1.558	2.844	1.820	2.297	4.878	.000
33	----------													
34	=VALUE-ADDED COEFFICIENTS:		TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	
35	=NMP D-Deflated (1980 Yuan)		.540	.400	.444	.277	.355	.452	.388	.403	.456	.219		
36	=NMP Current-Priced		.426	.528	.308	.217	.298	.508	.359	.553	.385	.369		
37	=GDP D-Deflated (1980 Yuan)		.542	.403	.447	.283	.365	.500	.414	.423	.479	.264	.146	
38	=GDP Current-Priced		.429	.530	.311	.223	.309	.545	.387	.565	.409	.401	.397	
39	=Domestic Pr Indx ('80 = 1)		1.098	1.872	1.094	1.176	.963	1.311	.982	1.594	.966	1.426	2.388	1.027
40	=Dollar Pr Indx ('80 = 1)		.946	1.522	1.045	1.041	1.220	.933	1.105	.986	.859	1.315	1.036	.910
41	=PP Par Ex Rt ('80 Y/Cur $)		1.300	1.719	1.502	4.276	3.792	.533	1.587	1.785	1.885	1.610	2.043	.000
42	==========													
43	*GROWTH RATIOS:													
44	----------													
45	*MISCELLANEOUS VARIABLES:		TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	
46	*Domestic Pr Indx ('80 = 1)		1.052	1.522	1.107	1.070	1.035	1.204	1.035	1.400	1.017	1.332	2.255	1.052
47	*Dol. Price Index ('80 = 1)		1.035	1.497	1.017	1.052	1.126	1.107	1.035	1.246	.983	1.204	.967	.992
48	*Disembodied Productivity		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
49	*Economy-wide Input Efficiency		1.016	1.084	1.048	1.122	1.039	.9778	.9396	1.023	1.069	1.148	1.035	
50	*I-O COEFFICIENTS GROWTH:													
51	*Total Grains --> ...		1.072	.944	.689	.394	.984	.984	.984	.984	.984	.984	.984	
52	*Other Foods --> ...		1.568	1.512	.966	.581	.922	.922	.922	.922	.922	1.568	.922	
53	*Agricul. Raw. Mat. --> ...		1.717	1.832	1.956	1.813	2.385	.954	.954	.954	1.526	1.813	.954	
54	*Processed Foods --> ...		.936	1.034	.615	3.743	.891	.891	.891	.891	.954	.891	.891	
55	*Consumer Manuf. --> ...		.577	.577	.385	.577	.645	.962	.673	.558	.673	.556	.683	
56	*Energy and Fuels --> ...		8.693	8.181	2.966	.501	.501	.767	.511	.747	.614	.542	.552	
57	*Producer Machinery --> ...		1.916	2.129	.745	.819	.841	1.596	1.139	.788	.777	.851	.926	
58	*Agricultural Chem. --> ...		2.346	3.911	2.346	.978	.929	.939	.929	1.369	.919	.939	.978	
59	*Other Heavy Indus. --> ...		.936	.936	.655	.936	1.011	2.714	.814	.562	.842	.927	1.058	
60	*Other Prod. Sectors --> ...		.740	.801	.523	.854	1.568	.854	.854	.871	.871	2.526	1.051	
61	*Non-Prod. Services --> ...		1.739	.966	1.159	1.739	1.063	1.739	.966	.966	.966	.966	3.092	
62	*Depreciation Coef.('80 Y)		1.080	1.075	1.135	1.065	1.105	1.045	1.090	1.110	1.075	1.105	1.085	
63	*Export Ex Rt (80 Y/Cur $)		.966	.668	.983	.951	.888	.903	.966	.803	1.017	.831	1.034	
64	*Import Ex Rt ('80 Y/Cur $)		.966	.668	.983	.951	.888	.903	.966	.803	1.017	.831	1.034	
65	*Urban Population		2.219		Rural Populat		.983		Total Populati		1.262			
66	*PP Par Ex Rt (80 Y/Cur $)		.966	.668	.983	.951	.888	.903	.966	.803	1.017	.831	1.034	
67	==========													

the low scenario, where it is, indeed, stagnant. This is in fact true for all agricultural prices. In contrast, prices of consumer manufactures (cell G11) are lower in the high scenario than in the other two, with a similar difference evident for producers' machinery (cell I11). The price of energy, on the other hand, is higher for the high scenario and lower for the low.

The economic significance of these differences has mainly to do with incentives, profitability, and urban-rural terms of trade. Higher agricultural prices imply a wealthier rural community with added purchasing power and greater incentives to expand output. Higher prices for energy, however, have the effect of forcing efficiency on heavy energy-using sectors, with this factor perhaps over-shadowing the importance of prices as an incentive for output, given the likely heavy state control over energy production.

For consumer manufactures and producer machinery, a third economic mechanism is implied. Greater competition and price flexibility in industry is very likely to result in lower prices than would be the case if reforms stalled and political forces protected ministries and enterprise profit levels. In sum, the pattern of domestic price change says a great deal about the evolution of the economy, and these differences between the scenarios show themselves at different stages in the projections.

For international prices (dollar prices), the most interesting sectors are probably consumer manufactures and energy. In both cases, higher prices correspond to the baseline and high scenarios. For consumer manufactures the higher prices reflect higher quality goods, and more importantly, strong world demand in an apparently healthy international economy. This state of the world economy is also reflected in energy prices, which would be much firmer in a world of expanding trade opportunities. For energy, the projected prices in either high or low scenario suits China's likely conditions of net energy exports and imports, respectively.

INPUT-OUTPUT COEFFICIENTS:

The patterns of change in input-output (I-O) coefficients are numerous and rich with interpretations. Only a few of the most important will be dealt with here.

I-O coefficients into agriculture: the most interesting cells are those for agricultural chemicals and for grains into other foods (primarily animal husbandry in this case). Chemicals, mostly fertilizers, form an increasingly larger part of farm inputs as we move from low to baseline to high scenarios (compare cells C21, D21, and E21 in the three tables). The shift is most striking for other foods (D21), because vegetables and fruits receive lower allocations than grains and industrial crops under the more rigid distribution system likely to accompany stalled rural commercial reforms in the low scenario.

An important agricutural I-O cell for the high scenario is D14, from grains into other foods. Its large value relative to that of the other scenarios reflects a large-scale effort in the high scenario to fatten livestock with grains in an environment of good grain supply, both produced and imported. Other cells for agriculture are potentially interesting, especially in cells C19, D19, and E19 (energy inputs) and C14 (grains into grains), which reflects much higher-yielding varieties and considerable disembodied increases in productivity.

Energy inputs into other sectors: Row 19 shows the shares of output accounted for by energy inputs in various sectors, and cells H19, I19, and K19 deserve special attention. The coefficient of energy into itself (H19) is shown to be higher for the low scenario than the others, reflecting much larger-scale operations in the baseline and high cases. In I19 and K19, energy use changes little for producers' machinery but shows considerable savings for heavy industry.

More significant than the differences between the scenarios in this regard, however, is the energy savings in all scenarios over the base-year, 1983. This can be seen in the growth ratios presented in row 56. With the exception of agricuture, energy

conservation is projected to be highly significant. Furthermore, it is most significant for the lower scenario, presumably because energy is in such short supply that desparate measures are employed, measures which most likely greatly reduce the expansion of the economy.

Inputs into processed foods: the increased processing of grains (cell F14) in the high scenario and the much greater complexity of the sector in general (cell F17) in the higher case both reflect a more mature industry than the somewhat less developed one in the low scenario.

Diagonal cells: these cells are usually the largest in an I-O coefficient matrix, especially as the economy grows more complex. This trend is reflected in the diagonal cells of the three scenarios, with those for the high scenario larger than for the others. Of course, this reflects mainly an increase in specialization within the industry, as larger numbers of firms sell specialized intermediate-use inputs to one another. The most striking exception is for energy, as already noted above.

This completes the brief discussion of I-O coefficients. It is sufficient, however to point out some of the major differences between the scenarios and to give the most useful interpretations of these differences.

DEPRECIATION AND SHADOW EXCHANGE RATES:

Rows 26 to 28 and 30 present projections for depreciation and shadow exchange rates. Depreciation coefficients are in general higher somewhat for the high scenario, because of the greater capital intensity of the more rapidly-growing economy. The exchange rates result directly from the assumptions made about dollar price trends (see above). A good example is the difference in the shadow exchange rates for energy (cells H27, H28, and H30) in the three scenarios. As the world price of energy is higher in the high scenario, so the constant-price 1980 yuan equivalent for a given dollar-priced amount is reduced.

POPULATION:

As explained in the introduction above, the low scenario is plagued with more rapid population growth and a lower rate of urbanization. These differences are explicitly presented in row 29. The differences in urbanization need not reflect comparable diffrences in migration. It is likely in the higher scenario that many areas formerly designated as rural will have attained the status of cities and official urbanization will have occured without any large-scale migration to already-exisiting cities.

VALUE-ADDED COEFFICIENTS:

As explained in the specification report, the most useful value-added coefficients for modeling are probably the current-priced NMP and GDP sectoral coefficients. They show, to a certain degree, the financial viabilty of the sectors in question, and the degree to which the projected intermediate-use pattern is compatible with the pattern of price changes over the same period.

Looking at the coefficients for NMP in row 36 of each case's COEFF spreadsheet (Tables 1-B, 1-H, and 1-L) we see that in general value-added coefficients decline as the scenario improves, the exceptions being energy and agricultural chemicals (H36 and J36). The decline is most dramatic for the light industrial sectors of processed foods (F36) and consumer manufactures (G36). The important point, however, is not the trend in profitability, because there is no sound theoretical basis for its prediction. It is rather the general financial viability of the sector in general, after all the shifts in prices and technology have been accounted for.

This completes the overview of differences in assumptions and results for the first spreadsheet in the Wharton China model. The impact of these assumptions can be seen in the results obtained in the two other major spreadsheets, BALAN and FLOWS. These are discussed in some detail below.

SECTORAL BALANCES

The sectoral balances spreadsheet is the keystone of the model, and comparisons of its scenario results reveal the most interesting differences between the baseline, high, and low cases. Comparisons can be seen in tables 2-B, 2-H, and 2-L.

AGRICULTURE:

Rows 7 to 9 reveal the different assumptions and results for agriculture.

Planted area: cells C7, F7, and N7 show the assumptions about cultivated and planted land. The baseline pattern reflects an annual average decline in land available for cultivation of 1.0 percent a year. However, because the multiple cropping index increases, total planted area expands. This pattern is true of the other scenarios as well, although in the high scenario, the decline in cultivated area is much smaller. This is based on an assumption for the high case that there is a significant amount of planted land which is not reported in the early 1980's, but which will be reported by the late 1990s. The observant reader will notice that effective yields will be lower, or seem to have grown less rapidly, as a result.

Much of this "windfall" gain in planted area accrues to grains in the high scenario, while in the low case, other foods and industrial crops see a much slower expansion. These patterns conform with concepts of maturity in the agricultural sector of a land-poor, labor-rich country such as China.

The other important crop components are value yields. In general, the yields are higher for the baseline and high cases than for the low. The exception is the unique case of grains in the high scenerio, when under-reported planted area is included, diluting the effective value yield, since output data are probably accurate.

The difference in crop output growth (N33) for the three scenarios is significant: 4.1 percent annually for the baseline, 5.1

Table 2-B

YEAR 2000 BASELINE SECTORAL BALANCE FLOW TABLE - CHINA MACRO MODEL

^Total Cultivated Area (Ha)	71.7	^Cr Index:	2.1	^Planted Area (Ha):				TG 96.0	OF 12.2	IC 34.0	GM 6.4	TC 148.6
^Animal Husbandry GVO (80Y)	84.6	^All Sideline:	296.3	^Val. Yield (80Y/Ha				1407	13514	1666	81	2404
^Marine Products (1980 Y):	13.3	^Forest Prds:	43.5	^Crop GVO ('80 Y)				135.0	165.0	56.6	.5	357.2
^SECTORAL BALANCES:	TG	OF	AH	PF	CF	EF	PM	AC	OV	PS	NS	TO
^GVO (1980 Yuan)	135.0	262.9	357.0	278.2	534.4	165.86	490.9	141.1	715.9	850.4	676.2	4647.8
^GDP Produced (1980 Yuan)	87.3	96.4	46.5	146.2	191.2	10.6	118.9	-1.3	-19.9	348.7	418.7	1445.2
^FOB Exports (1980 Yuan)	1.6	6.2	11.7	3.7	164.5	5.7	2.4	.0	6.6	.5	.1	202.4
^FOB Exports (Cur. Dollars)	3.0	7.6	9.6	.9	46.0	12.7	1.4	.0	4.2	.3	.1	85.2
^Urban Per Cap. C. (80 Y)	88.4	108.2	31.1	176.2	105.5	9.2	.1	.3	.0	171.0	617.7	1307.9
^Rural Per Cap. C. ('80 Y)	84.0	56.9	39.9	69.4	18.7	4.9	.2	5.8	.0	17.9	112.3	411.8
^GDP Consumption (1980 Yuan)	105.9	99.6	44.3	144.7	71.1	8.4	.2	4.1	.0	106.9	418.5	1004.0
^GDP Investment (1980 Yuan)	.0	.0	.0	.0	.0	.0	175.5	.0	4.4	241.3	.0	421.6
^FOB Imports (1980 Yuan)	20.2	7.7	9.5	2.2	44.5	3.6	59.6	5.4	30.9	.0	.0	183.5
^FOB Imports (Cur. Dollars)	9.4	2.7	7.0	.5	12.2	7.6	33.1	2.6	13.2	.0	.0	88.5
^CURRENT ACCOUNT AND DEBT:												
^Net Service Exports (Cur $)	.4	Commodity Trade Bal (Cur $)			-3.3		Interest Earnings, Net (Cur $)					1.4
^Net In-Transfers (Cur $)	.5	Current Account Bal (Cur $)			-1.0		Net Debt, Year-end (Cur $)					-9.6
*GROWTH RATIOS:								TG	OF	IC	GM	TC
*Total Cultivated Area (Ha)	.843	Cr Index:	1.225	Planted Area (Ha):				.843	2.013	1.936	1.000	1.023
*Animal Husbandry GVO (80Y)	2.000	All Sideline:	5.898	Val. Yield ('80Y/Ha)				1.552	1.566	1.400	1.086	1.939
*Marine Products (1980 Y)	2.693	Forestry Prd:	3.700	Crop GVO ('80 Y):				1.308	3.019	2.710	1.088	1.993
*SECTORAL BALANCES:	TG	OF	AH	PF	CF	EF	PM	AC	OV	PS	NS	TO
*GVO (1980 Yuan)	1.306	2.580	4.761	3.5	3.1484	2.38	4.0469	B	4.5865	5.0240	7.7	4.009
*GDP Produced (1980 Yuan)	1.1313	1.7353	1.3657	2.2842	4.0669	1.3059	3.5367	-.6449	6.3345	3.4328	5.4875	2.9056
*FOB Exports (1980 Yuan)	5.054	1.600	5.895	5.460	5.054	2.113	1.522	2.113	1.288	2.292	2.113	5.466
*FOB Exports (Cur. Dollars)	5.054	2.240	6.980	6.006	5.984	2.722	1.397	2.419	1.224	2.714	2.145	3.636
*Urban Per Cap. C. ('80 Y)	1.042	1.350	.918	1.700	1.800	1.052	1.000	1.000	1.000	2.485	2.693	1.956
*Rural Per Cap. C. ('80 Y)	1.059	1.200	1.145	1.340	1.600	1.107	1.000	1.288	1.000	2.693	3.700	1.519
*GDP Consumption (1980 Yuan)	1.299	1.756	1.264	2.251	3.155	1.544	1.099B	1.136	.9151B	5.106	5.490	2.739
*GDP Investment (1980 Yuan)	1.000	1.000	1.000	1.000	1.000	1.000	4.328	1.000	2.917	3.000	1.000	3.439
*FOB Imports (1980 Yuan)	4.328	1.9480	3.1590	2.292	5.5000	60.000	6.8000	3.4190	3.159	1.286	1.4	4.4518
*FOB Imports (Cur. Dollars)	4.33	2.73	3.74	2.52	6.51	77.28	6.24	3.91	3.60	1.52	1.42	5.02
*CURRENT ACCOUNT AND DEBT:												
*Net Service Exports (Cur $)	2.579						Interest Earnings, Net (Cur $)					1.350
*Net In-Transfers (Cur $)	1.000						Interest Rate, (Decimal)					.140

Table 2-m

YEAR 2000 HIGH SCENARIO SECTORAL BALANCE FLOW TABLE - CHINA MACRO MODEL

									TG	OF	IC	GM	TC
^Total Cultivated Area (Ha)	78.2	^Cr Index:	2.3	^Planted Area (Ha):					124.1	12.4	36.2	6.5	179.2
^Animal Husbandry GVO ('80Y)	123.4	^All Sideline:	319.6	^Val. Yield ('80Y/ha					1380	1440	1751	82	231
^Marine Products (1980 Y):	16.1	^Forest Prds:	47.1	^Crop GVO ('80 Y)					171.2	179.1	63.5	.5	414.3
^SECTORAL BALANCES:	TG	OF	AH	PF	CF	EF	PM	AC	OV	PS	NS	TD	
^GVO (1980 Yuan)	171.2	318.6	430.7	361.9	607.2	218.68	630.9	195.2	867.3	1055.7	722.1	5579.4	
^GDP Produced (1980 Yuan)	99.9	113.1	42.8	191.8	214.6	16.9	136.2	-4.2	-21.9	437.3	501.6	1728.0	
^FOB Exports (1980 Yuan)	1.6	7.2	12.3	3.8	187.5	11.3	2.9	.0	8.2	.6	.2	234.8	
^FOB Exports (Cur. Dollars)	2.7	6.8	10.9	1.0	55.1	27.4	1.4	.0	5.1	.3	.1	110.4	
^Urban Per Cap. C. ('80 Y)	107.5	120.2	27.1	222.9	110.5	12.1	.1	.3	.0	207.3	665.2	1473.2	
^Rural Per Cap. C. ('80 Y)	107.3	71.1	41.8	93.2	44.5	6.5	.2	6.1	.0	49.9	165.7	586.4	
^GDP Consumption (1980 Yuan)	128.6	115.0	41.2	190.3	93.4	11.1	.2	3.8	.0	155.2	501.5	1240.2	
^GDP Investment (1980 Yuan)	.0	.0	.0	.0	.0	.0	197.1	.0	5.2	281.5	.0	483.8	
^FOB Imports (1980 Yuan)	30.4	9.1	10.7	2.4	66.3	5.6	63.9	8.0	35.3	.0	.0	231.6	
^FOB Imports (Cur. Dollars)	13.0	2.5	8.6	.6	19.2	13.1	29.9	3.7	14.6	.0	.0	105.1	
^CURRENT ACCOUNT AND DEBT:													
^Net Service Exports (Cur $)	.4	Commodity Trade Bal (Cur $)		5.3	Interest Earnings, Net (Cur $)							2.1	
^Net In-Transfers (Cur $)	.5	Current Account Bal (Cur $)		8.2	Net Debt, Year-end (Cur $)							-18.8	
#GROWTH RATIOS:									TG	OF	IC	GM	TC
#Total Cultivated Area (Ha)	.920	Cr Index:	1.354	Planted Area (Ha):					1.090	2.050	2.063	1.010	1.246
#Animal Husbandry GVO ('80Y)	2.917	All Sideline:	6.363	Val. Yield ('80Y/ha)					1.522	1.599	1.472	1.107	1.856
#Marine Products (1980 Y)	3.261	Forestry Prd:	4.002	Crop GVO ('80 Y):					1.659	3.278	3.037	1.118	2.312
#SECTORAL BALANCES:	TG	OF	AH	PF	CF	EF	PM	AC	OV	PS	NS	TD	
#GVO (1980 Yuan)	1.659	3.127	5.166	4.5529	3.5774	3.1380	5.2003	11.070	5.5563	6.2371	8.2229	4.612	
#GDP Produced (1980 Yuan)	1.2942	1.9941	1.257	2.9956	4.5640	2.0846	4.0502	-2.105	6.9682	4.3057	6.5748	3.4743	
#FOB Exports (1980 Yuan)	5.000	1.850	6.200	5.700	5.760	4.200	1.800	2.500	1.600	2.900	2.400	5.700	
#FOB Exports (Cur. Dollars)	4.590	2.013	7.986	6.983	7.177	5.880	1.391	2.675	1.469	2.709	3.197	4.963	
#Urban Per Cap. C. ('80 Y)	1.267	1.500	.800	2.150	1.885	1.377	1.000	1.000	1.000	3.012	2.900	2.204	
#Rural Per Cap. C. ('80 Y)	1.354	1.450	1.200	1.800	3.816	1.472	1.000	1.300	1.000	7.519	5.460	2.151	
#GDP Consumption (1980 Yuan)	1.578	2.025	1.174	2.960	4.141	2.046	1.0399	1.053	.81521	7.414	6.578	3.364	
#GDP Investment (1980 Yuan)	1.000	1.000	1.000	1.000	1.000	1.000	4.850	1.000	3.400	3.500	1.000	3.946	
#FOB Imports (1980 Yuan)	6.5000	2.3	3.5400	2.5000	8.2000	95.000	7.3000	5.1000	3.6000	1.9	1.8	5.6698	
#FOB Imports (Cur. Dollars)	5.97	2.50	4.56	3.06	10.22	133.00	5.64	5.46	3.30	1.77	2.40	5.97	
#CURRENT ACCOUNT AND DEBT:													
#Net Service Exports (Cur $)	2.824							Interest Earnings, Net (Cur $)				1.968	
#Net In-Transfers (Cur $)	1.000							Interest Rate, (Decimal)				.140	

Table 2-L

YEAR 2000 LOW SCENARIO SECTORAL BALANCE FLOW TABLE - CHINA MACRO MODEL

									TG	OF	IC	GM	TC
^Total Cultivated Area (Ha)	71.5	^Cr Index:	1.9	^Planted Area (Ha):				96.5	10.0	23.3	6.3	136.1
^Animal Husbandry GVO (80Y)	61.3	^All Sideline:	211.0	^Val. Yield (80Y/Ha				1224	12163	1606	80	204.
^Marine Products (198. Y):	9.6	^Forest Prds:	28.2	^Crop GVO (80 Y)				118.2	121.7	37.4	.5	277.8
^SECTORAL BALANCES:	TG	OF	AW	PF	CF	EF	PM	AC	Ov	PS	NS	TC
^GVO (1980 Yuan)	118.2	192.7	277.1	173.4	402.7	96.136	336.5	85.1	413.6	521.2	372.6	2691.7
^GDP Produced (1980 Yuan)	85.1	93.2	41.2	103.8	179.3	-2.2	95.2	-3.7	.4	262.6	221.4	1076.2
^FOB Exports (1980 Yuan)	1.0	5.5	8.6	2.9	135.1	3.9	2.0	.0	9.2	.4	.1	168.7
^FOB Exports (Cur. Dollars)	2.0	7.2	6.1	.7	35.9	7.5	1.2	.0	6.1	.2	.1	66.1
^Urban Per Cap. C. (80 Y)	86.5	96.2	30.2	119.2	87.9	8.4	.1	.3	.0	92.9	373.5	895.7
^Rural Per Cap. C. (80 Y)	80.1	56.4	55.8	55.4	15.2	4.1	.2	4.9	.0	7.8	41.0	298.9
^GDP Consumption (1980 Yuan)	105.6	92.3	41.3	103.2	56.3	7.5	.2	3.9	.0	53.1	221.3	684.7
^GDP Investment (1980 Yuan)	.0	.0	.0	.0	.0	.0	109.7	.0	4.4	209.1	.0	323.3
^FOB Imports (1980 Yuan)	21.5	4.6	6.7	2.4	12.1	13.6	16.6	7.7	13.2	.0	.0	106.5
^FOB Imports (Cur. Dollars)	10.4	1.7	5.5	.6	3.2	25.1	10.4	4.1	5.8	.0	.0	66.8
^CURRENT ACCOUNT AND DEBT:												
^Net Service Exports (Cur $)	.3	Commodity Trade Bal (Cur $)				-.2		Interest Earnings, Net (Cur $)				1.6
^Net In-Transfers (Cur $)	.5	Current Account Ba. (Cur $)				2.2		Net Debt, Year-end (Cur $)				-12.8
#GROWTH RATIOS:									TG	OF	IC	GM	TC
#Total Cultivated Area (Ha)	.841	Cr Index:	1.125	Planted Area (Ha):				.848	1.650	1.3268	.980	.942
#Animal Husbandry GVO (80Y)	1.450	All Sideline:	4.200	Val. Yield (80Y/Ha				1.350	1.350	1.350	1.072	1.678
#Marine Products (1980 Y)	1.950	Forestry Prd:	2.400	Crop GVO (80 Y):				1.145	2.228	1.791	1.051	1.55
#SECTORAL BALANCES:	TG	OF	AW	PF	CF	EF	PM	AC	Ov	PS	NS	TC
#GVO (1980 Yuan)	1.145	1.85[illegible]	3.324	2.182[illegible]	2.3724	1.4082	2.7742	4.8287	2.65	3.0795	4.2424	2.58[illegible]
#GDP Produced (1980 Yuan)	1.1033	1.6429	1.2119	1.6219	3.8129	-.2775	2.8316	-1.8[illegible]	-.139[illegible]	2.5654	2.962[illegible]	2.[illegible]29
#FOB Exports (1980 Yuan)	3.261	1.42[illegible]	4.350	4.400	4.150	1.450	1.230	1.800	1.800	1.750	1.800	4.40[illegible]
#FOB Exports (Cur. Dollars)	3.375	2.126	4.424	4.629	4.673	1.605	1.273	2.143	1.769	2.107	1.741	2.954
#Urban Per Cap. C. (80 Y)	1.020	1.20[illegible]	.890	1.150	1.500	.960	1.000	1.00[illegible]	1.000	1.350	1.62[illegible]	1.340
#Rural Per Cap. C. (80 Y)	1.010	1.15[illegible]	.970	1.070	1.300	.940	1.000	1.100	1.000	1.170	1.35[illegible]	1.09[illegible]
#GDP Consumption (1980 Yuan)	1.295	1.625	1.180	1.605	2.497	1.368	1.1691	1.100	1.0228	2.537	2.96[illegible]	1.868
#GDP Investment (1980 Yuan)	1.000	1.000	1.000	1.000	1.000	1.000	2.700	1.000	2.917	2.000	1.000	2.67[illegible]
#FOB Imports (1980 Yuan)	4.6000	1.1700	2.9000	2.5	1.5000	230.00	1.9000	4.9000	1.35[illegible]	1.61	1.1	2.4605
#FOB Imports (Cur. Dollars)	4.76	1.75	2.95	2.63	1.69	254.61	1.97	6.11	1.33	1.95	1.16	3.75
#CURRENT ACCOUNT AND DEBT:												
#Net Service Exports (Cur $)	2.020							Interest Earnings, Net (Cur $				1.566
#Net In-Transfers (Cur $)	1.000							Interest Rate, (Decimal)				.140

or the high case, and 2.6 for the low.

Other agricultural sectors such as animal husbandry (C9) and marine products (C9) in general show more rapid growth of output in the high and baseline cases than in the low scenario. As a result, when these are combined with the crop results, the three major agriculture sectors (TG, OF, and AW) in cells C12, D12, and E12 show considerably more rapid growth in the high case than in the other two.

GROSS VALUE OUTPUT OF NON-AGRICULTURAL SECTORS:

The clearest picture of growth patterns for non-agricultural sectors is found in the growth ratio cells in row 36 of the BALAN spreadsheets (Tables 2-B, 2-H, and 2-L). In general, the growth is more rapid in the high scenario, and lowest in the low case.

Three industrial sectors should be singled out for comparison: consumer manufactures, energy, and producers' machinery (with growth ratios in cells G36, H36, and I36). Of these, energy (H36) is the most critical. Official Chinese plans call for doubling the output of primary energy between 1980 and 2000.

Growth of energy and fuels gross value output is different from growth of primary energy output, most notably because of the changes in double-counting for input-output flows within the energy sector itself. Nevertheless, gross value output is an indicator of primary energy output, and in the baseline, high, and low scenarios its growth ratios are 2.4, 3.1 and 1.4, respectively. The low case illustrates clear failure to find and exploit major new oil and coal deposits. Whether because of offshore oil disappointments or political unrest surrounding stalled reforms, this low scenario would leave China with a serious shortage of energy at the end of the century.

Consumer manufactures are important because of their role in China's exports (see cell G16) and because of the domestic demand generated by rising incomes. The consumer manufacture growth ratios for the baseline, high, and low cases are 3.1, 3.6, and 2.4,

respectively. These represent 7.0, 7.8, 5.2 percent average annual growth, respectively. The lower case would mean a much weakened ability to export quality products or satisfy consumer demand, perhaps seriously affecting incentives and productivity. The higher scenarios, in contrast, permits success in both dimensions.

Producers' machinery is of central importance to the issue of productivity, because not only their quantity but also their quality will dominate labor's productivity increases. Domestic production will not provide the most advanced technologies; these are represented by imports. But domestic production will have to supply the larger quantities of needed equipment, hopefully those which have already absorbed transferred technology. The baseline, high, and low case prescriptions reflect very different degrees of success in the industry, with 4.0, 5.2, and 2.8 growth ratios.

GDP PRODUCED:

As noted in the Specification Report, however, gross value output itself is a poor measure of output made available to the economy's final uses. Row 13 in Tables 2-B, 2-H, and 2-L show GDP produced, that is, gross value output after double counting has been removed.

The most striking difference between the three scenarios is the energy GDP produced projection (cell H13). The value is actually negative in the low case, reflecting the serious failure in energy production, which is unable to meet even inter-sectoral demand, much less all domestic demand. In the baseline and high scenarios, there is greater domestic provision of energy for final uses such as home heating and net exports.

The reverse pattern is observed for other heavy industrial sectors (K13). The high scenario illustrates strong demand for such industrial inputs as specialty metals and chemicals, while the low case does not, reflecting a much lower level of industrial sophistication.

FINAL DEMAND BY COMPONENTS

The model's final demand components are: exports, urban consumption, rural consumption, investment, and imports (negative).

For exports (rows 15 and 16), the overwhelmingly dominant sector is consumer manufactures (G15, G16), and hence the major difference in the three scenarios is its level. The baseline and high cases illustrate a Chinese economy much better able to meet a strong world demand for light industrial exports. Furthermore, comparing the current dollar export earnings (row 16) with the constant-priced yuan export level (row 15)j, we see that the dollar earnings in the baseline and high cases are further amplified by the more favorable sectoral shadow exchange rate, illustrating the higher unit price China's manufactures would bring in these scenarios, relative to the low case.

Final consumption (rows 18-20) is naturally concentrated in the agricutural, light manufacturing, and service sectors. The overall per-capita consumption levels by the urban and rural populations (cells N18 and N19) show that the roughly 3:1 ratio in real standard of living would be somewhat less exaggerated in the high scenario. Even the same urban-rural ratio, however, represents less effective inequality if the overall general level is higher, as it is in the baseline compared to the low scenario. In fact, the low case illustrates nearly stagnant per capita consumption of foods and processed foods, and extremely low growth in household or government consumption of consumer manufactures and energy. It is questionable whether such a society could long remain tranquil, given the high expectations of the early and mid-1980's.

An important part of the reason for low per-capita consumption growth in the low scenario, of course, is the significantly higher population growth assumed.

Investment demand for new structures and equipment (row 21) in contrast is supplied mainly by producer's machinery, other heavy industrial sectors, and other productive sectors (cells I21, K21, and L21). The construction industry is included in other productive

sectors. In general, investment as a share of GDP varies little between the scenarios. The levels, however, are very different in most cases, the effect of which over several years significantly raises the capital intensity of production.

Finally, import projections (rows 23 and 24) show a very different composition between the three scenarios. In general, the low scenario shows a dependence on international trade for energy and grains, with an inability to import producers' machinery, other heavy industrial products, or consumer manufactures to the degree possible in the baseline and high cases. Grain imports (C23, C24) in the high scenario are higher than the baseline, but this reflects large increases in demand, including demand by animal husbandry feedlots for concentrates. In contrast, the even higher grain imports in the low scenario reflect a shortfall in supply, a serious political-economic problem.

This completes the brief discussion of components of final demand in the three scenarios. The baseline scenario shows a healthy growth in per-capita consumption and a maturing pattern of international trade reflecting increased integration into the world economy. The high case carries these trends even further, including elements of a more sophisticated agricultural trade strategy. The low scenario, however, shows an economy under severe strains of stagnant consumption patterns and a balance of trade struggling to cover the costs of necessity imports with exports facing unfavorable markets.

CURRENT ACCOUNT PROJECTIONS:

The final elements in the BALAN spreadsheets (Tables 2-B, 2-H, and 2-L) are those for the balance on current account (lines 27 and 28). In general, these projections reflect the commodity trade balance (H27) and the level of international indebtedness, as reflected in the net interest payments. It is unlikely that China will allow a significant deficit or surplus on current account to persist. For this reason, the importance of the current account balance lies not in the projections of its components nor in the level of the surplus/deficit. Rather, the sectoral export and

import components of the trade balance discussed above give greater testimony to the strength or weakness of China's international position.

VALUE-ADDED FLOWS

The final spreadsheet used to show scenario results is the FLOWS spreadsheet showing sectoral and total value-added flows (Tables 3-B, 3-H, and 3-L). As explained in the Specification Report and the User's Guide, the various definitions of value added (single-deflated, double-deflated, and output-deflated) all have shortcomings. However, output deflation brings both aggregate accuracy and sectoral significance, with the only minor drawback of a purchasing-power interpretation. For this reason, it deserves the greatest attention in examining the FLOWS spreadsheets. Projections for the other variables are interesting more for purposes of academic comparison.

With this in mind, the major results are to be found in the growth ratios for real, output-deflated, GDP value added by sector (row 43 of Tables 3-B, 3-H, and 3-L). Notice that overall growth for value-added by both this definition and the double-deflation definition (cell N43) is the same as that for total GDP produced (cell N37 in Tables 2-B, 2-H, and 2-L), as it should be. Overall growth ratios in the three scenarios are 2.9, 3.5, and 1.9 for the baseline, high, and low cases, respectively. This translates into 6.5, 7.6, and 4.7 percent per annum.

Sectoral contributions to these totals vary considerably. For grains, real value-added has actually declined, labor intensity is reduced and intermediate inputs, in particular agricultural chemicals, increased. This phenomenon is not significant, however, for the high scenario, largely because of the disembodied increases in yields associated with better cultivation of the previously under-reported area planted.

In general the differences between the scenarios reflect the shifts already discussed above under the discussion of growth in

Table 3-B

YEAR 2000 BASELINE VALUE-ADDED FLOW TABLE - CHINA MACRO MODEL

^LOADED FROM CURRENT YEAR GROSS VALUE OUTPUT TABLE:

	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
^Gross Value Output (80 Prices)	135.0	262.9	397.0	278.2	534.4	165.9	490.9	141.1	715.9	850.4	676.2	4648.

^CALCULATED CURRENT YEAR VALUE-ADDED DATA:

^VALUE-ADDED FLOWS	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
^NMF D-Deflated (1980 Yuan)	67.60	87.31	157.1	46.22	191.6	76.10	178.6	45.45	296.1	81.47		1232.
^NMF S-Deflated (1980 Yuan)	52.21	126.2	123.9	39.48	132.4	96.61	149.2	71.19	203.6	218.6		1213.
^NMF O-Deflated (1980 Yuan)	52.98	128.1	125.8	40.07	134.4	98.05	151.5	72.25	206.6	221.8		1232.
^NMF Current-Priced (Yuan)	59.31	256.6	157.8	53.17	113.1	147.3	127.9	104.4	177.5	296.6		1494.
^NMF O-Deflated (1980 Dollars)	43.06	48.95	80.12	9.004	29.05	197.2	86.36	41.04	127.7	104.8		767.2
^NMF Current-Priced (Dollars)	39.37	69.66	97.45	9.798	37.26	214.1	84.68	37.20	106.0	135.5		830.9
^GDF D-Deflated (1980 Yuan)	66.00	88.09	156.5	47.90	197.2	84.03	191.9	52.34	312.5	119.7	125.0	1445.
^GDF S-Deflated (1980 Yuan)	52.55	126.6	124.9	40.69	138.6	101.6	164.3	73.09	221.9	245.9	289.6	1580.
^GDF O-Deflated (1980 Yuan)	48.07	115.8	114.3	37.22	127.0	92.98	150.3	66.86	203.0	224.9	264.9	1445.
^GDF Current-Priced (Yuan)	59.69	257.3	159.0	54.80	118.6	154.9	140.7	107.2	193.4	333.6	648.0	2227.
^GDF O-Deflated (1980 Dollars)	39.08	44.25	72.80	8.363	27.44	187.0	85.67	37.98	125.4	106.2	125.1	859.3
^GDF Current-Priced (Dollars)	35.72	62.99	88.54	9.101	35.21	203.0	84.00	34.43	104.1	137.3	136.1	930.5

*VALUE-ADDED GROWTH RATIOS	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
*NMF D-Deflated (1980 Yuan)	.9311	1.306	2.997	1.819	3.788	2.263	4.470	15.59	5.120	1.686		2.733
*NMF S-Deflated (1980 Yuan)	.7301	1.801	2.506	1.537	2.777	2.767	3.893	14.39	3.807	3.751		2.671
*NMF O-Deflated (1980 Yuan)	.7479	1.843	2.564	1.572	2.841	2.831	3.983	14.72	3.896	3.838		2.733
*NMF Current-Priced (Yuan)	.7943	2.976	3.227	1.883	2.549	3.873	3.515	18.54	3.495	4.752		3.140
*NMF O-Deflated (1980 Dollars)	.7470	1.843	2.564	1.572	2.841	2.831	3.983	14.72	3.896	3.838		2.686
*NMF Current-Priced (Dollars)	.7470	2.580	3.035	1.730	3.364	3.646	3.656	16.86	3.701	4.544		3.065
*GDF D-Deflated (1980 Yuan)	.9330	1.314	3.008	1.852	3.780	2.283	4.469	14.99	5.111	2.173	4.593	2.906
*GDF S-Deflated (1980 Yuan)	.7321	1.801	2.514	1.560	2.812	2.692	3.966	14.00	3.900	3.813	9.267	3.133
*GDF O-Deflated (1980 Yuan)	.6790	1.670	2.331	1.446	2.608	2.496	3.678	12.98	3.617	3.536	8.594	2.906
*GDF Current-Priced (Yuan)	.7966	2.977	3.238	1.911	2.582	3.768	3.582	18.03	3.580	4.832	19.58	4.221
*GDF O-Deflated (1980 Dollars)	.6790	1.670	2.331	1.446	2.608	2.496	3.678	12.98	3.617	3.536	8.594	2.754
*GDF Current-Priced (Dollars)	.6790	2.336	2.760	1.591	3.088	3.215	3.377	14.87	3.436	4.187	8.723	3.125

Table 3-H

YEAR 2000 HIGH SCENARIO VALUE-ADDED FLOW TABLE - CHINA MACRO MODEL

^LOADED FROM CURRENT YEAR GROSS VALUE OUTPUT TABLE:

	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
^Gross Value Output (`80 Prices	171.2	318.6	430.7	361.9	607.2	218.7	630.9	195.2	867.3	1056.	722.1	5575.

^CALCULATED CURRENT YEAR VALUE-ADDED DATA:

^VALUE-ADDED FLOWS	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
^NMP D-Deflated (1980 Yuan)	82.56	80.44	162.4	81.64	218.3	86.18	231.1	56.32	337.6	142.0		1479.
^NMP S-Deflated (1980 Yuan)	71.97	142.2	147.3	95.65	131.3	132.5	170.9	75.38	187.5	273.5		1428.
^NMP O-Deflated (1980 Yuan)	74.51	147.2	152.5	99.03	135.9	137.1	176.9	78.04	194.1	283.2		1479.
^NMP Current-Priced (Yuan)	88.97	313.9	203.9	157.4	103.0	238.4	125.3	93.35	150.1	329.8		1804.
^NMP O-Deflated (1980 Dollars)	60.58	56.25	97.16	22.25	29.38	275.8	100.9	44.33	119.9	133.8		940.3
^NMP Current-Priced (Dollars)	50.82	62.23	126.6	26.96	39.67	325.4	83.27	37.55	96.20	136.4		987.1
^GDP D-Deflated (1980 Yuan)	83.10	81.40	163.9	83.89	225.0	96.93	248.6	60.56	356.6	191.2	134.5	1726.
^GDP S-Deflated (1980 Yuan)	72.33	142.6	148.2	96.81	136.6	137.6	191.2	78.29	210.1	308.3	317.0	1841.
^GDP O-Deflated (1980 Yuan	67.89	133.8	139.1	90.87	130.1	129.1	179.5	73.49	197.2	289.4	297.6	1726.
^GDP Current-Priced (Yuan)	89.42	314.7	205.1	159.3	106.7	247.5	140.2	96.96	168.2	371.7	602.7	2505.
^GDP O-Deflated (1980 Dollars)	55.20	51.13	88.64	20.42	26.12	259.6	102.3	41.74	121.8	136.7	140.6	1046.
^GDP Current-Priced (Dollars)	46.31	56.56	117.3	24.74	37.95	306.4	84.49	35.36	97.70	139.4	200.7	1147.

*VALUE-ADDED GROWTH RATIOS	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
*NMP D-Deflated (1980 Yuan)	1.137	1.205	3.096	3.213	4.318	2.562	5.783	17.76	5.837	2.939		3.281
*NMP S-Deflated (1980 Yuan)	1.006	2.029	2.979	3.723	2.754	3.794	4.457	15.24	3.506	4.693		3.143
*NMP O-Deflated (1980 Yuan)	1.050	2.118	3.109	3.886	2.875	3.960	4.652	15.91	3.660	4.899		3.281
*NMP Current-Priced (Yuan)	1.192	3.642	4.170	5.574	2.322	6.271	3.445	16.58	2.956	5.285		3.754
*NMP O-Deflated (1980 Dollars)	1.050	2.118	3.109	3.866	2.875	3.960	4.652	15.91	3.660	4.899		3.292
*NMP Current-Priced (Dollars)	.9647	2.304	4.004	4.760	3.582	5.543	3.596	17.02	3.360	4.575		3.642
*GDP D-Deflated (1980 Yuan)	1.140	1.214	3.111	3.244	4.314	2.634	5.789	17.35	5.867	3.470	4.941	3.474
*GDP S-Deflated (1980 Yuan)	1.006	2.028	2.983	3.711	2.806	3.642	4.618	15.00	3.692	4.781	10.15	3.651
*GDP O-Deflated (1980 Yuan)	.9590	1.930	2.838	3.531	2.672	3.466	4.394	14.27	3.514	4.549	9.654	3.474
*GDP Current-Priced (Yuan)	1.193	3.640	4.176	5.555	2.367	6.021	3.569	16.32	3.113	5.383	18.21	4.747
*GDP O-Deflated (1980 Dollars)	.9590	1.930	2.838	3.531	2.672	3.466	4.394	14.27	3.514	4.549	9.654	3.354
*GDP Current-Priced (Dollars)	.8804	2.100	3.656	4.326	3.329	4.853	3.397	15.27	3.225	4.249	12.86	3.851

Table 3-L

YEAR 2000 LOW SCENARIO VALUE-ADDED FLOW TABLE - CHINA MACRO MODEL

^LOADED FROM CURRENT YEAR GROSS VALUE OUTPUT TABLE:

	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
^Gross Value Output ('80 Prices)	118.2	192.7	277.1	173.4	402.7	96.14	336.5	85.14	413.6	521.2	372.6	2991.

^CALCULATED CURRENT YEAR VALUE-ADDED DATA:

^VALUE-ADDED FLOWS	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
^NMP D-Deflated (1980 Yuan)	63.81	77.04	123.0	48.01	142.6	44.40	130.5	34.29	186.8	114.3		966.5
^NMP S-Deflated (1980 Yuan)	50.35	101.8	85.29	37.71	119.9	49.84	120.8	47.04	159.1	192.4		964.2
^NMP O-Deflated (1980 Yuan)	50.49	102.1	85.52	37.81	120.3	49.98	121.1	47.17	159.5	192.9		966.9
^NMP Current-Priced (Yuan)	55.30	190.5	93.33	44.36	115.6	65.33	118.6	74.96	153.6	274.4		1186.
^NMP O-Deflated (1980 Dollars)	41.05	39.00	54.49	8.497	26.00	100.5	69.05	26.79	98.56	91.13		555.1
^NMP Current-Priced (Dollars)	38.87	59.36	56.92	8.842	31.72	93.78	76.33	26.43	84.64	119.8		596.6
^GDP D-Deflated (1980 Yuan)	64.16	77.60	123.9	49.05	147.0	49.06	139.5	36.00	198.2	137.5	54.32	107e.
^GDP S-Deflated (1980 Yuan)	50.67	102.1	86.14	38.62	124.4	53.50	130.2	48.14	169.1	209.1	148.1	1160.
^GDP O-Deflated (1980 Yuan)	47.01	94.73	79.92	35.83	115.4	49.63	120.8	44.66	156.5	194.0	137.4	1076.
^GDP Current-Priced (Yuan)	55.66	191.1	94.26	45.43	119.9	70.12	127.8	76.72	163.3	298.2	353.6	1596.
^GDP O-Deflated (1980 Dollars)	38.22	36.19	50.92	8.051	24.95	99.81	68.88	25.37	96.95	91.61	64.88	605.8
^GDP Current-Priced (Dollars)	36.15	55.09	53.19	8.378	30.44	93.13	76.14	25.03	83.26	120.4	67.24	648.5

*VALUE-ADDED GROWTH RATIOS	TG	OF	AW	PF	CF	EF	PM	AC	OV	PS	NS	TO
*NMP D-Deflated (1980 Yuan)	.8790	1.154	2.345	1.889	2.824	1.320	3.265	10.81	3.263	2.366		2.145
*NMP S-Deflated (1980 Yuan)	.7041	1.452	1.725	1.468	2.516	1.427	3.150	9.509	2.974	3.301		2.122
*NMP O-Deflated (1980 Yuan)	.7118	1.466	1.743	1.484	2.543	1.443	3.184	9.613	3.007	3.338		2.145
*NMP Current-Priced (Yuan)	.7407	2.211	1.909	1.571	2.604	1.719	3.260	13.31	3.025	4.397		2.494
*NMP O-Deflated (1980 Dollars)	.7118	1.466	1.743	1.484	2.543	1.443	3.184	9.613	3.007	3.338		1.943
*NMP Current-Priced (Dollars)	.7367	2.198	1.773	1.561	2.864	1.597	3.296	11.98	2.956	4.018		2.201
*GDP D-Deflated (1980 Yuan)	.8803	1.158	2.351	1.897	2.818	1.333	3.248	10.31	3.241	2.494	1.995	2.164
*GDP S-Deflated (1980 Yuan)	.7060	1.452	1.733	1.480	2.521	1.417	3.144	9.222	2.973	3.242	4.736	2.301
*GDP O-Deflated (1980 Yuan)	.6641	1.366	1.630	1.392	2.371	1.332	2.957	8.674	2.796	3.050	4.456	2.164
*GDP Current-Priced (Yuan)	.7427	2.210	1.919	1.584	2.609	1.706	3.254	12.91	3.023	4.319	10.68	3.025
*GDP O-Deflated (1980 Dollars)	.6641	1.366	1.630	1.392	2.371	1.332	2.957	8.674	2.796	3.050	4.456	1.942
*GDP Current-Priced (Dollars)	.6873	2.045	1.658	1.465	2.670	1.475	3.061	10.81	2.749	3.672	4.309	2.178

gross value output. The comparison of energy's contribution (cell H43) is particularly striking. However, given the absolute output levels of each sector (row 26), the most significant sectoral growth projections are for consumer manufactures (G43), producers' machinery (I43), other heavy industry (J43), and other productive sectors (K43).

Looking at definitions of value added, it is interesting that single deflation gives a considerably inflated measure of output (N26) compared to the two accurate measures (N25, N27). Even more striking differences between definitions are found in sectoral comparisons of double-deflated and output-deflated GDP (rows 24 and 26). Interesting examples are consumer manufactures (G24, G26) and producers' machinery (I24, I26). Given that these definitions have identical totals for the whole economy, the double-deflation definition clearly distorts the real contribution of value added from individual sectors.

To summarize, use of the output-deflated value-added measure reversals in these tables that the contributions to real overall growth are much less from industry than the double-deflation concept would indicate. In particular, the double-deflation method greatly underestimates the contribution of non-productive services (cells M26 and M43), while seriously exaggerating the contributions of consumer manufactures (G26, G43) and other heavy industry (K26, K43).

This concludes the discussion of value-added flows and the model projections in general.

CONCLUSION TO SCENARIO REPORT

The projection scenarios presented above show both the flexibility of the Wharton model and the range of potential for the Chinese economy in the year 2000. The model musters technical, accounting and policy assumptions and required relationships to form a coherent and useful description.

Wharton

Econometric Forecasting Associates

China

Macroeconomic Model

TRADE DATA SOURCES REPORT

U.S. Department of State

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CHINA TRADE DATA SOURCES REPORT

INTRODUCTION

The following pages present a report on sources of Chinese trade data, with a brief comparison of their main characteristics. It should be said at the outset that Chinese trade data have become much more easily available since 1982, and data in even greater detail are expected to be forthcoming. For this reason, the formerly keen interest in estimating China's trade flows from partial information and educated assumptions has greatly reduced. Nevertheless, there is still a great deal of benefit to be gained from a basic understanding of the institutional sources, definitions, classification levels, valuation, and scope of Chinese trade data. Such an understanding can anticipate seemingly conflicting reports and aid in the generation of trade and balance of payments projections.

The report is divided into three main parts and a conclusion. The main parts discuss (a) conceptual issues, (b) comparisons of time series from different sources, and (c) comparisons of cross-sectional data at the SITC 2-digit level.

CONCEPTUAL ISSUES

An introductory understanding of several basic trade data concepts will greatly assist the reader in following the trade data comparisons in subsequent sections and forms an essential foundation for further empirical research on Chinese trade. These conceptual topics include an understanding of the different institutional sources of Chinese trade, some basic definitions, a discussion of the timing element in measuring of trade flows, an introduction to classification schemes, some treatment of units and valuation, and mention of the problem of scope.

INSTITUTIONAL SOURCES

In general, there are two major categories of institutions providing data on China's trade: official Chinese, and non-Chinese.

Official Chinese trade data have appeared very rapidly since the late 1970's. They come from three main sources: the Customs General Administration, the Ministry of Foreign Economic Relations and Trade, and the Bank of China. Differences in the data collected and reported by these three organizations, even for the same time period, reflect their individual purposes and workings.

The Customs Administration monitors trade as it crosses the border and is responsible for levying tariffs and duties on the trade. Records from this monitoring form the basis for customs statistics, the most detailed and now the most widely used of the three. The Ministry of Trade, among other things, supervises the various foreign trade corporations, which in turn keep statistics on their transactions. These records become the basis for data from the Ministry of Trade. The Bank of China, however, records payments associated with trade, not the actual trade itself. These payments, nevertheless, form an import an aspect of trade, and they can be used as a close proxy for actual trade flows in value terms.

It should be clear that data collected in different ways and for different purposes will yield different conclusions about the overall level of China s trade. These differences are more than errors and omissions. There are systematic factors influencing their uniqueness. Customs statistics are usually taken as the standard because they supposedly measure everything that enters and leaves the country. Ministry of Trade data, however, might ignore data on goods not purchased or sold. Examples are deliveries of goods as part of a counter-trade or processing arrangement. For the Bank of China data, there are additional complications, because payment is not always made at time of shipment or delivery. The payments can even be in a different quarter or year, potentially leading to discrepencies and confusions. There is no way to say one of these is the "right" way and the others wrong. The student of China's trade should nevertheless be aware of the differences. Specific comparisons of different data series from these sources are given below.

Non-Chinese trade data are based on so-called "partner country" statistics. By collecting trade data from China's trading partners it is possible to piece together what China's total trade is or was in some particular period. The drawbacks of this method of measurement result mostly from the difficulty of gathering an exhaustive set of data from all China s trading partners in the world, as well as from the problem of reliability of trade data from many countries in the world. An advantage to the method, however, is its ability to capture trade flows which are not reported by Chinese officials, usually for political reasons.

Other non-Chinese sources are institutions like the World Bank, IMF, and the United Nations. The sources for their data have generally been discussed above. The World Bank has in the past obtained its data from official sources, both Bank of China and Ministry of Foreign Trade. The IMF's sources are very similar. The United Nations, however, relies on patner country data for much of its information.

DEFINITIONS FOB/CIF

When using data from different institutional sources, one set of definitions is useful to keep in mind. Two popular ways of defining the value of a cargo are (a) to value it when it is put on

the ship or airplane (called FOB for "Free On Board"), (b) to value the cargo after it has arrived in its destination, where its value includes shipping charges and insurance (called CIF for "Cost Insurance and Freight," or "Charged-In-Full"). Since both concepts include the cost of the commodities, the difference between the measures should be the total of insurance and freight charges.

These insurance and freight charges are, however, difficult to measure independently in developing economies such as China s. For China they represent roughly 8-10 percent of the value of the traded goods.

The difference between CIF and FOB is important, however, because China s Customs Administration reports imports CIF, while trading partners report those same goods as exports, which are valued FOB. Furthermore, in order to measure accurately the "visible" trade for calculating balance of payments, both exports and imports must be FOB. This is because not all shipping and insurance are purchased from foreign companies and hence shouldn t be considered imports. For those shipping and insurance services which are purchased from foreign companies, the correct place to analyse them is as "invisible" transactions in the balance of payments.

For these reasons, the CIF/FOB difference is significant, and estimates of the difference for Chinese imports is important for undertaking any balance of payments analysis.

TIMING OF MEASUREMENT

The question of timing in measuring trade flows has already been mentioned above in connection with the Bank of China, whose measurements of payments for trade might not be in the same period in which the goods were delivered.

A second area of timing concern is related to the partner country trade statistics introduced above. Traded goods can be in transit for weeks, and if there are transfers and delays, the delivery time can be months. It is easy to see that what a trading partner might consider data for one year could indeed be data for the next. This would occur if, for example, goods were shipped at the end of one year and received at the start of the next. If trade were steady, these factors would not be important, because the errors picked up at the start of the year would be cancelled by the reverse process at the end of the year. For an economy with foreign trade volume increasing as rapidly as China's, however, the distortion could be significant, and the researcher or student of China trade could be aware of its potential importance.

TRADE CLASSIFICATION SCHEMES

The Chinese Customs Administration has adopted the Standard International Trade Classification (SITC) convention with very few minor adjustments for reporting trade data since 1981. The SITC system reports trade in different degrees of detail depending on the "digits" level of detail. For example, the one-digit level has ten categories from zero to nine which cover all possible commodities of traded goods. The two-digit level of detail could hypothetically have 100 categories from 00 to 99, but in fact there are fewer than these.

The SITC classification has the advantage that it is internationally known, and is easily understandable. Hence, it invites comparisons between Chinese data and those of partner trading countries.

There are other classifications used by the Chinese, in some cases holdovers from the more ideological interpretations of economics. The simplest of these reports imports as either "means of production" or "means of subsistence." Exports are reported as "industrial and mineral products," "processed farm and sideline products," and "farm and sideline products."

A second more detailed classification scheme divides traded goods into "primary goods" and "manufactured goods." Within these major headings there are 9 subheadings; manufactured goods are further divided into heavy and light industrial products. Although these classification schemes are not particularly important for purposes of comparison with the West and Japan, they do give the student of Chinese trade an understanding of how rapid and fundamental the reforms in trade administration have been.

This concludes the brief introduction to China's trade classifications. See the Customs statistics themselves for a discussion of the details of China's SITC system. The other definitions can be found in the statistical yearbooks published by the State Statistical Bureau. It is worth mentioning that China will begin publishing 3- and 4-digit SITC trade data sometime early in 1985.

UNITS AND VALUATION

China's trade is recorded in various units, and it is important to understand what they do and do not represent.

At the most basic level, most traded goods are recorded in physical terms, that is, in units such as tons, or pieces, or sets. Where the good is homogenous and of even quality, such as for natural gas, grain, or crude petroleum, these units are quite valuable. For heterogeneous goods, however, they are not. This is the case for machinery of all kinds, as well as beverages, processed foods, and other consumer manufactures.

Measurement of trade in value terms is naturally the most useful for economic analysis. Such measurements are somewhat complicated in China, because although data are often officially announced in yuan, it is understood that the Customs Administration keeps its own principal records in U.S. dollars and only converts it to yuan at the "official" exchange rate for purposes of reporting. The official exchange rate has been almost irrelevant for practical trading purposes. It is useful to know, however, that this is the way Chines calculations are made. The student can take official yuan-valued trade data and covert to dollars at the official rate and come close to the dollar-valued statistics needed for balance-of-payments analysis.

Understanding what the "real" trade flows are, however, requires estimation of shadow exchange rates. This is because the dollar prices China pays and receives for traded goods are set at world market levels, regardless of what domestic prices might be. There is no common parity between China and the rest of the world. Estimation of such exchange rates is difficult, and sufficient data are not yet available. Nevertheless, research in China's trade almost requires an investigation of individual shadow exchange rates if the importance of trade for the domestic economy is to be understood.

SCOPE

The final conceptual topic is the scope of trade measures. The main topic of interest centers around systematic omissions of part of China's trade from reporting statistics. Examples of such omissions are smuggling and un-reported imports to avoid duties, and exports which are politically sensitive, such as weapons to Iran, which by accounts from trading partner countries must be very large. They do not appear at all in the reported trade statistics.

Such shortcomings might seem unimportant in the larger scheme of things, but they need to be remembered when analysts are comparing trade data from different sources as part of a balance of payments and debt calcuation exercise. Commodity trade and the trade balance form the backbone of such analysis.

This completes the short discussion of conceptual issues in understanding the sources of Chinese trade statistics. In the following pages the report presents some actual comparisons of different estimates for Chinese trade.

TRADE TIME-SERIES COMPARISONS

Tables 1, 2, and 3 below present selections from the Wharton trade data banks which illustrate the differences between trade data from different sources. Table 1 shows data on exports in current U.S. dollars from various sources. They all present data for the

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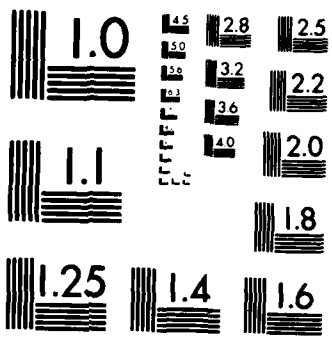

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

A B C D E F G H I

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Total Exports - Official Data (current dollars)
Official Total Exports data from various sources

Table 1

Total Exports - Official Data
(in current dollars)

	SSB Stats. Yr. Bk. (b.US$)	Official MOFT customs (b.US$)	IMF IFS Reported Stats (b.US$)	W.B. Report (BOC) (b.US$)	CIA Partnern Country (b.US$)	IMF memo China's (BOP) (b.US$)
	TEECCN	TEECCN	TEECCN	TEECCN	TEECCN	TEECCN
1949	N/A	N/A	N/A	N/A	N/A	N/A
1950	.55	N/A	N/A	N/A	N/A	N/A
1951	.76	N/A	N/A	N/A	N/A	N/A
1952	.82	N/A	N/A	N/A	N/A	N/A
1953	1.02	N/A	N/A	N/A	N/A	N/A
1954	1.15	N/A	N/A	N/A	N/A	N/A
1955	1.41	N/A	N/A	N/A	N/A	N/A
1956	1.65	N/A	N/A	N/A	N/A	N/A
1957	1.60	N/A	N/A	N/A	N/A	N/A
1958	1.98	N/A	N/A	N/A	N/A	N/A
1959	2.26	N/A	N/A	N/A	N/A	N/A
1960	1.86	N/A	N/A	N/A	N/A	N/A
1961	1.49	N/A	N/A	N/A	N/A	N/A
1962	1.49	N/A	N/A	N/A	N/A	N/A
1963	1.65	N/A	N/A	N/A	N/A	N/A
1964	1.92	N/A	N/A	N/A	N/A	N/A
1965	2.23	N/A	N/A	N/A	N/A	N/A
1966	2.37	N/A	N/A	N/A	N/A	N/A
1967	2.14	N/A	N/A	N/A	N/A	N/A
1968	2.10	N/A	N/A	N/A	N/A	N/A
1969	2.20	N/A	N/A	N/A	N/A	N/A
1970	2.26	N/A	N/A	N/A	2.16	N/A
1971	2.64	N/A	N/A	N/A	2.53	N/A
1972	3.44	N/A	N/A	N/A	3.23	N/A
1973	5.82	N/A	N/A	N/A	5.11	N/A
1974	6.95	N/A	N/A	N/A	6.76	N/A
1975	7.26	N/A	N/A	N/A	7.12	N/A
1976	6.86	N/A	6.94	N/A	7.27	N/A
1977	7.59	N/A	7.52	N/A	8.18	N/A
1978	9.75	9.75	9.96	9.51	10.17	9.61
1979	13.66	13.66	13.61	13.12	13.48	13.66
1980	18.27	18.12	18.18	17.51	18.92	18.49
1981	N/A	21.56	21.56	N/A	21.64	22.03
1982	N/A	21.94	N/A	N/A	22.36	N/A
1983	N/A	N/A	N/A	N/A	N/A	N/A
1984	N/A	N/A	N/A	N/A	N/A	N/A

Sources, see below
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Total Imports - Official Data from various sources (in current dollars)

Table 2

Total Imports (CIF) - Official Data
(current dollars)

	SSB Stats Yr. Bk. (b.US$)	Official MOFT customs (b.US$)	IMF IFS Reported Stats (b.US$)	W.B. Report BOC (b.US$)
	TMECCN	TMECCN	TMECCN	TMECCN
1949	N/A	N/A	N/A	N/A
1950	.58	N/A	N/A	N/A
1951	1.2	N/A	N/A	N/A
1952	1.12	N/A	N/A	N/A
1953	1.35	N/A	N/A	N/A
1954	1.29	N/A	N/A	N/A
1955	1.73	N/A	N/A	N/A
1956	1.56	N/A	N/A	N/A
1957	1.51	N/A	N/A	N/A
1958	1.89	N/A	N/A	N/A
1959	2.12	N/A	N/A	N/A
1960	1.95	N/A	N/A	N/A
1961	1.45	N/A	N/A	N/A
1962	1.17	N/A	N/A	N/A
1963	1.27	N/A	N/A	N/A
1964	1.55	N/A	N/A	N/A
1965	2.02	N/A	N/A	N/A
1966	2.25	N/A	N/A	N/A
1967	2.02	N/A	N/A	N/A
1968	1.95	N/A	N/A	N/A
1969	1.83	N/A	N/A	N/A
1970	2.33	N/A	N/A	N/A
1971	2.21	N/A	N/A	N/A
1972	2.86	N/A	N/A	N/A
1973	5.16	N/A	N/A	N/A
1974	7.62	N/A	N/A	N/A
1975	7.49	N/A	N/A	N/A
1976	6.58	N/A	6.66	N/A
1977	7.21	N/A	7.15	7.63
1978	10.89	10.89	11.13	11.4
1979	15.67	15.69	15.69	16.17
1980	19.55	19.39	19.45	21.68
1981	N/A	21.56	21.57	N/A
1982	N/A	18.94	18.94	N/A
1983	N/A	N/A	N/A	N/A
1984	N/A	N/A	N/A	N/A

Sources, see below
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Total Imports - Official Data from various sources (in current dollars)

Table 3

Total Imports (FOB) - Official Data (current dollars)

	SSB Statistical Yr. Bk.	Official MOFT customs data	IMF IFS Reported Stats (Units)	World Bank Report BOC	CIA Partner Country Stats	IMF Memo. on China's BOP
	TMECCN	TMECCN	TMECCN	TMECCN	TMECCN	TMECCN
1949	N/A	N/A	N/A	N/A	N/A	N/A
1950	.54	N/A	N/A	N/A	N/A	N/A
1951	1.11	N/A	N/A	N/A	N/A	N/A
1952	1.03	N/A	N/A	N/A	N/A	N/A
1953	1.25	N/A	N/A	N/A	N/A	N/A
1954	1.19	N/A	N/A	N/A	N/A	N/A
1955	1.60	N/A	N/A	N/A	N/A	N/A
1956	1.44	N/A	N/A	N/A	N/A	N/A
1957	1.39	N/A	N/A	N/A	N/A	N/A
1958	1.75	N/A	N/A	N/A	N/A	N/A
1959	1.96	N/A	N/A	N/A	N/A	N/A
1960	1.80	N/A	N/A	N/A	N/A	N/A
1961	1.34	N/A	N/A	N/A	N/A	N/A
1962	1.08	N/A	N/A	N/A	N/A	N/A
1963	1.17	N/A	N/A	N/A	N/A	N/A
1964	1.43	N/A	N/A	N/A	N/A	N/A
1965	1.87	N/A	N/A	N/A	N/A	N/A
1966	2.08	N/A	N/A	N/A	N/A	N/A
1967	1.87	N/A	N/A	N/A	N/A	N/A
1968	1.80	N/A	N/A	N/A	N/A	N/A
1969	1.69	N/A	N/A	N/A	N/A	N/A
1970	2.15	N/A	N/A	N/A	2.04	N/A
1971	2.04	N/A	N/A	N/A	2.14	N/A
1972	2.64	N/A	N/A	N/A	2.59	N/A
1973	4.77	N/A	N/A	N/A	4.56	N/A
1974	7.04	N/A	N/A	N/A	6.72	N/A
1975	6.92	N/A	N/A	N/A	6.82	N/A
1976	6.08	N/A	6.15	N/A	5.57	N/A
1977	6.66	N/A	6.60	7.05	6.61	N/A
1978	10.06	10.06	10.28	10.53	10.33	10.75
1979	14.47	14.49	14.49	14.93	14.40	15.62
1980	18.05	17.91	17.96	20.02	19.30	21.24
1981	N/A	19.91	19.92	N/A	17.94	20.29
1982	N/A	17.49	17.49	N/A	16.08	N/A
1983	N/A	N/A	N/A	N/A	N/A	N/A
1984	N/A	N/A	N/A	N/A	N/A	N/A

Sources, see below
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years 1978-80. Table 1 is interesting because even data from the same organization can be different.

The first two columns represent official export data from the State Statistical bureau and customs data. Nearly identical, they diverge slightly in 1980. The third, fourth, and sixth columns show data from international agencies, in this case the IMF and the World Bank. Both organizations receive their original data from Chinese sources. The IMF data, based on Ministry of Foreign Trade data are quite close to those of the Customs Administration, while the World Bank's data, based on Bank of China data, are in general lower than the other series. This could be because of delayed payments in a period of rapidly growing trade.

Finally, perhaps the most interesting comparison is the detailed compilation of partner-country trade statistics by the CIA, presented in the fifth column. These data report the traded goods received by China's trading partners. It is interesting to see just how close these estimates for exports are to the official statistics. Although one might quibble over some of the potentially troublesome problems of timing and scope, in general official and partner-country data on exports tend to confirm one another's accuracy.

Time-series comparisons for imports are given in Tables 2 and 3. Here again, the most interesting comparison is between the official data in the first two columns of Table 2 and the CIA partner-country compilations in the next-to-last column of Table 3. In general, the Customs data are higher than the partner country estimates. This is as one would expect, since the Customs data are CIF while partner data came from reported exports to China, recorded FOB. It is unusual to see such a rapid growth in the difference between the two. Whereas the customs data were only 8-9 percent more than the partner numbers in 1978-79, by 1981-82 the gap had grown to 17 and 20 percent.

The point is that because of the CIF/FOB difference, and also because of the greater difficulty China may have in recording all imports (see the comparison for 1980), estimating imports is more difficult than exports, which tend to be recorded rather eagerly.

In sum, the various institutional sources of Chinese trade data do produce somewhat different data. However, the differences are not great enough to keep us from learning the general direction of trade, and even its commodity composition. The problem of how to estimate CIF charges remains a difficult one.

2-DIGIT SITC COMPARISONS

Tables 4, 5, and 6, again from the Wharton Trade Data Banks, make a much more detailed comparison of official data and partner country compilations. The comparison is made for each of the 109 2-digit export and import categories common to the CIA and official conventions. Furthermore, the data have been processed so as to

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1981-1983 TOTAL CIA SITC 2 DIGIT SERIES
(Million Current Dollars)

Table 4

SITC First Digit \ Second Digit		Section Total	0	1	2	3	4	5	6	7	8	9
Exports												
TE0CLN	0	10,582.8	1,125.1	1,165.7	269.3	1,162.7	1,573.4	3,121.3	573.5	1,020.9	417.6	152.7
TE1CLN	1	404.0	228.3	175.4								
TE2CLN	2	5,776.1	243.1	1,091.2	17.1	65.2	2.1	1,665.5	845.1	449.9	1,397.1	
TE3CLN	3	15,009.5	1,180.0	13,828.6	1.0							
TE4CLN	4	288.0	1.2	278.4	8.7							
TE5CLN	5	3,859.4	1,739.3	244.5	616.4	312.1	16.1	322.2	154.4	454.4		
TE6CLN	6	15,268.5	216.4	170.4	166.7	514.0	9,334.7	1,413.0	1,189.3	630.7	1,633.2	
TE7CLN	7	2,428.4	976.2	1,100.3	352.0							
TE8CLN	8	12,334.6	210.8	538.6	443.9	7,292.7	813.2	436.8	2,598.6			
TE9CLN	9	2,975.9										
Imports												
TM0CLN	0	8,738.9	6.6	6.4	81.3	15.9	6,419.2	274.8	1,595.6	197.2	114.9	27
TM1CLN	1	266.0	46.0	219.9								
TM2CLN	2	7,905.3	59.8	292.4	728.7	781.4	508.7	4,809.5	211.9	265.2	248.0	
TM3CLN	3	521.0	364.9	96.8	1.3	58.0						
TM4CLN	4	325.9	50.0	253.9	21.9							
TM5CLN	5	6,396.6	1,580.3	395.6	102.0	78.1	1,943.6	2.4	1,680.9	614.2		
TM6CLN	6	13,770.9	456.1	41.2	119.3	585.7	3,719.3	519.2	6,237.5	1,346.3	746.8	
TM7CLN	7	12,337.3	5,830.8	3,243.9	3,263.3							
TM8CLN	8	2,259.8	29.5	27.8	4.2	151.7	4.8	1,194.5	847.6			
TM9CLN	9	505.4										

SOURCES: see below

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1981-1983 TOTAL CUSTOMS SITC 2 DIGIT SERIES

Table 5

SITC First Digit \ Second Digit		Section Total	0	1	2	3	4	5	6	7	8	9	Section Total
Exports													
TE0CLN	0	8636.18	1074.81	1302.44	222.52	993.69	727.52	2455.68	322.98	974.78	396.82	164.94	8636.18
TE1CLN	1	260.26	148.12	112.14									260.3
TE2CLN	2	5471.07	270.70	942.25	13.27	37.22	.50	1715.57	626.38	658.26	1206.92		5,471.1
TE3CLN	3	14910.94	1099.11	13809.34	2.49								14,910.9
TE4CLN	4	268.10	1.38	263.12	3.60								268.1
TE5CLN	5	3768.09	1777.67	219.82	754.25	299.65	5.46	191.44	124.75	395.05			3,768.1
TE6CLN	6	13290.23	216.77	167.94	83.48	455.87	8035.24	981.84	1208.30	566.49	1574.29		13,290.2
TE7CLN	7	3577.08	1278.12	1220.20	1078.76								3,577.1
TE8CLN	8	11034.10	162.20	402.91	301.11	5830.92	675.34	404.96	3256.67				11,155.4
TE9CLN	9	4630.98											4,631.0
Imports													65,968.3
TM0CLN	0	10860.69	8.06	2.43	87.24	62.11	8698.22	139.23	1532.32	161.92	144.37	24.79	10,860.7
TM1CLN	1	387.81	14.53	373.28									387.8
TM2CLN	2	9449.61	219.51	295.83	657.82	1359.31	883.32	4959.63	255.58	589.18	229.43		9,449.6
TM3CLN	3	378.41	175.53	146.61	1.49	54.78							378.4
TM4CLN	4	276.13	73.44	200.41	2.28								276.1
TM5CLN	5	8685.11	2033.05	339.42	116.40	21.18	3916.56	1.31	1776.28	480.90			8,685.0
TM6CLN	6	14122.39	194.74	19.37	426.49	789.91	2776.52	451.91	6871.46	2415.54	176.47		14,122.4
TM7CLN	7	12946.37	7800.72	2624.50	2521.15								12,946.4
TM8CLN	8	1812.08	21.57	23.74	1.07	25.34	1.21	1380.52	358.64				1,812.1
TM9CLN	9	3338.10											3,338.1
													62,256.7

SOURCES: EXCHANGE RATE FROM "INTERNATIONAL FINANCIAL STATISTICS, JULY, 1984, rf rate
Chinese Customs Statistics, China Economic Information & Agency, Hong Kong

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1982 Raw Conversion Coefficients CIA/Customs
(Million Current Dollars)

Table 6

SITC First Digit \ Second Digit		Section Total	0	1	2	3	4	5	6	7	8	9
Exports												
TE0CLN	0	1.23	1.05	.90	1.21	1.17	2.16	1.27	1.78	1.05	1.05	.93
TE1CLN	1	1.55	1.54	1.56								
TE2CLN	2	1.06	.90	1.16	1.29	1.75	4.19	.97	1.35	.68	1.16	
TE3CLN	3	1.01	1.07	1.00	.40							
TE4CLN	4	1.07	.87	1.06	2.41							
TE5CLN	5	1.02	.98	1.11	.82	1.04	2.95	1.68	1.24	1.15		
TE6CLN	6	1.15	1.00	1.01	2.00	1.13	1.16	1.44	.98	1.11	1.04	
TE7CLN	7	.68	.76	.90	.33							
TE8CLN	8	1.12	1.30	1.34	1.47	1.25	1.20	1.08	.80			
TE9CLN	9	.64										
Imports												
TM0CLN	0	.80	.82	2.63	.93	.26	.74	1.97	1.04	1.22	.80	1.10
TM1CLN	1	.69	3.17	.59								
TM2CLN	2	.84	.27	.99	1.11	.57	.58	.97	.83	.45	1.08	
TM3CLN	3	1.38	2.08	.66	.87	1.06						
TM4CLN	4	1.18	.68	1.27	9.59							
TM5CLN	5	.74	.78	1.17	.88	3.69	.50	1.84	.95	1.28		
TM6CLN	6	.98	2.34	2.13	.28	.74	1.34	1.15	.91	.56	4.23	
TM7CLN	7	.95	.75	1.24	1.29							
TM8CLN	8	1.25	1.37	1.17	3.93	5.99	3.96	.87	2.36			
TM9CLN	9	.15										

SOURCES: Exchange rate from "International Financial Statistics," July, 1984, rf R
Customs Data from "Chinese Customs Statistics,"
Economic Information & Agency, Hong Kong
CIA Data from "China:International Trade Statistics" various years

avoid problems of timing as much as possible. For each category, the total trade level over three years is used for comparison purposes.

Table 4 on page 10 gives first the CIA-compiled partner-country trade statistics. Exports are given first, and then imports. The digits down the left-hand side are the first digits in the codes, whole those along the top of the table give the second digit. For example, the exports for SITC 2-digit category 64 (paper and paper articles) was 9,334.7 milion dollars from 1981 through 1983.

Similarly, Table 5 on page 11 presents equivalent data from official customs statistics sources. Notice that export category 64 in this table is 8,035 million dollars, which is quite different from the partner country estimate.

A more systematic set of comparisons is given in Table 6 on page 12. The entries in this table are the ratios of CIA-compiled partner-country data and official customs data. The numbers under the column "Section Total" show the comparisons for 1-digit categories, while the other ratios are for 2-digit classifications.

One would expect the 1-digit comparisons to be closer to 1.0, since the absolute entries are higher. One would also expect certain carefully monitored categories such as fuels (SITC 3) to be similar in both cases. This turns out to be true for exports but not for imports. In general, with a few exceptions, the 1-digit export ratios are relatively close to 1.0 . Imports, however, are not. Indeed, we would expect the ratio to be less than one, since CIA imports are FOB, while customs are CIF. The exceptions to this expectation are categories 3 (fuels), 4 (Animal and vegetable oils), and 8 (miscellaneous manufacures).

Referring back to Tables 4 and 5, the observant reader will notice that those ratios which are very different from 1.0 are also the ones with the smaller volume of trade. This supports an hypothesis that the observed differences are not systematic errors in the partner-country compilation method, but are rather random errors which have a higher probability of influencing a small aggregate than a much larger one.

In sum, without further information, all that can be said is that for large aggregates, when random errors have the chance to cancel one another out, the two methods of measuring trade, official customs and partner data compilation, yield mutually confirming results. The major lesson is that the rich supply of trade data recently made available is proving to be consistent with other sources of information and to earn our trust as a valuable source of data, especially with regard to the forthecoming 3- and 4-digit data.

CONCLUSION

This concludes a brief statistical look at the major differences in sources of China trade data. The rapid pace of new data release has made much of the earlier independent compilation work out-dated. But there are differences and difficulties in using Chinese trade data, which require thorough understanding if analysis is to have significance. This report has introduced the most basic skills and understandings involved.

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